



## Evaluation of the Prevalence of Vertical - Transmission and its correlation with some Haematological variables Among Ante-natal Attendees in Port-Harcourt

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### Abstract

Vertical transmission of HIV is the third most common way in which HIV is transmitted worldwide and one of the biggest challenges of the HIV/AIDS disease especially in undeveloped countries. The purpose of this study is to determine the prevalence of vertical transmission of HIV infection among ante-natal attendees in two major hospitals in Port Harcourt and hence the effectiveness of the prevention of mother-to-child transmission programme in these centers. To effectively carry out this study, the HIV sero-status of ante-natal mothers between April 2015 – May 2016 (4,262 for both BMSH and UPTH at the first instance) and the HIV exposed infants were determined using various screening techniques according to the National Algorithm of HIV testing and the HIV-DNA Polymerase Chain Reaction technique on dried blood spots with QIAamp DNA mini kit for the babies, the ABO/Rh type of the mother/baby pairs using standard tube technique were determined, the packed cell volume of mothers were determined using haematocrit centrifuge, and the Hb genotype of the mothers/baby pairs were determine using Hb electrophoresis technique. The outcome of the various investigations were subjected to statistical package for social science (SPSS) software (version 17.0, SPSS Chicago, USA) which showed an overall sero-prevalence rate of 4.34% (185/4262) for the mothers and 7.57%(14/185) for the babies, 3.8% of the women were anaemic, 62.2% were blood group O, 25.4% A, 9.7% B and 2.7% AB while the Rh analysis showed 60% O positive, 2.2% O negative, 23.2% A positive, 2.2% A negative 9.2% B positive, and 0.5% B negative, 1.6% AB positive and 1.1% AB negative. Overall 94% were Rh D positive and 6% were Rh D negative, the Hb genotype revealed 79% AA, 19.5% AS and 0.5% SS. This data could serve as a baseline to monitor the trend of the disease and hence eliminate the incidence of the disease.

**Keywords:** HIV, Vertical transmission, anti-natal care, Port Harcourt.

### Introduction

Human Immunodeficiency Virus (HIV) is now known all over the world as the causative agent of Acquired Immunodeficiency syndrome (AIDs),

which is characterized by progressive immune failure that ushers in life threatening opportunistic infections, carcinogenesis and eventually death<sup>[1]</sup>. Infection with HIV is the worst epidemic that the

world has ever known in decades. It has been described as heterogenic, because it varies from country to country and population to population. According to The Joint United Programme on HIV and AIDS, UNAIDS (2017) report, an average of 36.7 million (range, 30.8million-42.9million) people were living with HIV at the end of 2016 worldwide; of this number 1.8million (1.6million – 2.1 million) persons were newly infected at a rate of 5,000 persons per day<sup>[2]</sup>. This report also indicated that about half of the global HIV prevalence are women within the reproductive age. In Nigeria, there were an estimated 3.2million people living with HIV by the end of 2016, with 250,000 new infections; of which 59.38% are women<sup>[3]</sup>. This makes Nigeria to have the second largest number of people living with HIV after South Africa in the world.

In the 2016 HIV Sero-prevalence Sentinel Survey Report in Nigeria, Rivers State is leading other states in the country with a prevalence rate of 15.2%<sup>[4][5]</sup>. This brings about 400,000 thousand people living with HIV in the state of which 6% are pregnant women<sup>[6]</sup>. The consequences of HIV infection in pregnancy include repeated abortion, premature birth, intrauterine growth retardation, still birth, congenital abnormalities, embryopathies and vertical transmission. Mother to Child Transmission of HIV which is also known as perinatal transmission of Human Immunodeficiency Virus (HIV) is the transmission of HIV from an HIV positive mother to her child during pregnancy, labor, delivery or breast feeding<sup>[7][8]</sup>. This is the third most common way in which HIV is transmitted worldwide and one of the biggest challenges of the HIV/AIDS disease especially in undeveloped countries. More than 90% of the world's 2.3 million children living with HIV get infected through vertical transmission. Africa has the highest burden of the disease accounting for about 90% of pediatric HIV infections. Nigeria accounts for about 30% of the global burden of MTCT (Mother To Child Transmission); with a MTCT rate of about 26.5% and 60,000 new infant HIV infections per annum;

making Nigeria one of the 22 focus countries of the Global Plan to Eliminate MTCT, <sup>[3][9]</sup>.

The high prevalence of HIV in the country, coupled with a high total fertility rate of 5.5 births per woman, crude birth rate of 41/1000 population make vertical transmission an important route of spread of HIV in Nigeria <sup>[10]</sup>. It is estimated that about 60,000 infants contract HIV infections from their mothers annually in Nigeria during pregnancy, delivery, and breastfeeding periods <sup>[3]</sup>. According to WHO, (The World Health Organization) and UNAIDS in 2013, HIV exposed or infected babies without intervention have up to 50% chance of dying before their second birthday. Other risk factors include low birth weight in term pregnancies that is small for gestational age (SGA) infants compared to babies born to non-HIV positive mothers, more rapid rate of disease progression in children born by HIV positive mother via vertical transmission and frequent hospital visitations with its associated economic loss.

Prevention of mother to child transmission (PMTCT) of HIV is a global interventional program initiated by the United Nations Organization to protect the children of the world from the scourge of the HIV pandemic <sup>[11]</sup>. This program commonly involves the use of antiretroviral (ARV) chemoprophylaxis, either as drug combination regimens or mono-therapy regimens. Other strategies employed by PMTCT include not feeding the baby with pre-chewed food from HIV infected persons, adopting cesarean section delivering method and babies not breast-fed in mothers whose viral load is high. Therefore, the aim of this study was to evaluate the prevalence of vertical transmission of HIV among antenatal attendees in two major hospitals in Port Harcourt, Rivers-State and hence the effectiveness of the PMTCT program in these centers, prompting the research questions; To what extent does the HIV sero-status of the antenatal attendees result to vertical transmission? How does ABO and Rh type of the mother affect vertical transmission of HIV? How does packed

cell volume (PCV) of the mother affect vertical transmission of HIV? How does HB Genotype of the mother affect vertical transmission of HIV? What is the relationship between the times of booking for ante-natal, the gender of the HIV exposed baby and vertical transmission? What is the relationship between HB genotype of mothers and sero-positivity of the babies?

## **Materials and Methods**

### **Study Design**

This was a prospective cross-sectional study conducted among antenatal attendees who had counseling on HIV infection and antiretroviral therapy (ART).

### **Study Locations**

This study was conducted at two (2) different hospital settings in Port Harcourt, Rivers State: University of Port Harcourt Teaching Hospital (UPTH) and Braithwaite Memorial Specialist Hospital (BMSH). The facilities were chosen because of the PMTCT programme and the numerous numbers of women that attend the antenatal care regularly on week days.

### **Study Population**

The study populations for the research were women of childbearing age attending antenatal clinics at University of Port Harcourt Teaching Hospital (UPTH) and Braithwaite Memorial Specialist Hospital (BMSH). A total of 4,262 apparently healthy pregnant women who were attending the Antenatal Clinics of the above two (2) different hospital settings in Port Harcourt, Rivers State were consecutively recruited for this study. The bio-data and medical history of each of the pregnant women were obtained from the individual's folder. Demographic data obtained from the pregnant women include age, religion, occupation and educational level.

### **Calculation of Sub-Sample Size**

Purposive sampling using the Total Population Sampling technique was used. A sub-sample population of HIV positive pregnant women were recruited from the general study population.

### **Ethical Approval/Informed Consent**

The ethical clearance was obtained from the ethical committee from both hospitals and informed consent was obtained from the HIV positive women and their babies (see appendix 1 &2).

### **Blood Sample Collection**

Five millimetres (5mls) of venous blood was collected from the cubital vein of each antenatal participant using standard venepuncture technique into EDTA bottles and mixed properly to avoid blood clotting. Two millimetres (2mls) of whole blood was collected from the HIV exposed neonates into EDTA bottles and properly mixed.

### **Methodologies**

All the pregnant HIV sero-positive mothers were screened for PCV, human immunodeficiency virus (HIV) antibodies, HB Genotype and ABO/Rhesus types, their babies were screened for HIV antibodies, ABO/Rh type and HB Genotype. All analyses were carried out according to standard procedures. Packed cell volume (PCV) was determined by the micro-haematocrit method. HIV screening was performed using Determine HIV-1/2 (Abbott Laboratories, Illinois, USA), Uni-gold Recombigen HIV Diagnostic Kits (Alpha And Omega Diagnostics-India), Statpak HIV test kit (Chembio Diagnostic Systems USA) according to the national algorithm for HIV screening which employs serial testing technique using two screening kits sequentially to investigate the HIV antibody and polymerase chain reaction (PCR) techniques, ABO/Rh type was determined using standard tube method while the HB Genotype was done using the HB Electrophoresis technique.

### **Interpretation of Results and Quality Control**

Results were interpreted following guidelines from the manufacturers. As a quality control measure, a pink/purple line should always appear in the control area if the test has been performed correctly and the device is working properly. It serves as an internal procedural control. Good Laboratory Practice (GLP) recommends the use of control materials along with the test samples to

ensure proper performance of the test kit. Chembio HIV reactive and nonreactive serum or plasma based commercial controls were used for this purpose. The controls were used as per the test procedure according to manufacturer's instructions.

#### Determination of Haemoglobin Electrophoresis Patterns

Using the cellulose acetate alkaline haemoglobin electrophoresis technique the Hb electrophoresis was done: this technique allows the separation of Hb A, F, S and C into different bands, the haemolysate of each sample was prepared and the electrophoresis done in the electrophoretic chamber containing Tris buffer solution for 20 minutes at 230V. Controls were prepared by using haemolysate of people with a known haemoglobin types. The distance of migration of the test sample from the control when compared gives the test result.

#### Data Analysis

Statistical Package for Social Science (SPSS) software (version 17.0, SPSS, Chicago, USA) was used for the data analysis. Pearson's Chi square test where appropriate Fisher's exact tests were used in a univariate analysis for categorical

variables. Student's t-test was used to test for difference among continuous variables. A probability value (p-value) of  $<0.05$  was considered significant. Strengths of association were reported using odds ratio (OR) and 95% confidence intervals (CI) were calculated.

#### Results

Two thousand one hundred and sixty-two (2,162) representing 50.73% of the attendees were examined at UPTH, of which, 98(4.53%) were found to be sero-positive; while the remaining two thousand one hundred (2,100) antenatal attendees representing 49.27% were at BMSH, of which, 87(4.14%) were sero-positive. The two hospitals gave a combined sero-prevalence rate of 4.34% (185/4262). All the seropositive expectant women were positive for HIV-1 alone. None was positive for HIV-2. The women were between the ages of 14 and 39 years (mean  $27.4 \pm 4.3$  years). The details are as shown in Table 4.1.

Those 185 HIV-positive antenatal attendees constituted the main study subpopulation (subjects). Each of them was immediately placed on 300mg daily dose of Triple Regimen antiretroviral drug at their first day of booking.

**Table 4.1:** General Characteristics of the Total Antenatal Attendees Screened For HIV-1 and 2 at both UPTH and BMSH

Study Site	Total number of antenatal attendees	Age Range and Mean (years)	Number of HIV Positive Women	Number of HIV Negative Women
UPTH	2,162	16-42 (27.4±4.3)	98 (4.53%)	2,064 (95.47%)
BMSH	2,100	14-43 (26.6±3.1)	87 (4.14%)	2,013 (95.86%)
Total	4,262	185 (4.34%)	4,077 (95.66%)	185 (4.34%)

Table 4.2 denotes the frequency distribution of the HIV-positive expectant mothers according to age groups. Analysis of variance (ANOVA) shows statistically significant difference among the age groups, ( $X^2=4.391$ ,  $df=3$ ,  $P<0.05$ ). Those between the ages of 28 and 34 years had the highest frequency of 59.5% (110/185). This was followed by the 21 to 27 age group with 25.4%. Those aged 35-43 years had a proportion of 13.5%, while those between the ages of 14 and 20 years had the

lowest seropositive rate (1.6%). HIV prevalence increased with age from 1.6% among the 14-20 years age group to 25.4% among the 21-27 years age group and then to 59.5% among the 28-34 years age group and thereafter decreased with age. HIV seropositivity was found in all the age groups.

**Table 4.2:** Frequency Distribution of HIV-Positive Expectant Mothers According to Age Groups

Age Groups	BMSH (n=87)	UPTH (n=98)	Frequency (%) Combined (n=185)
14-20	1 (1.1)	2 (2.0)	3 (1.6)
21-27	31 (35.6)	16 (16.3)	47 (25.4)
28-34	48 (55.2)	62 (63.3)	110 (59.5)
35 – 43	7 (8.1)	18 (18.4)	25 (13.5)
<b>Total</b>	<b>87 (100)</b>	<b>98(100)</b>	<b>185 (100)</b>

Table 4.3 displays the frequency distribution of the HIV-positive antenatal attendees according to gestational age at booking. Statistical analysis highlights significant differences among the antenatal attendees at their gestational age at booking ( $X^2=6.212$ ,  $df=2$ ,  $P<0.05$ ). At both

UPTH and BMSH, the antenatal attendees were mostly in their second trimester of pregnancy (57.3%). This was followed by those in their third trimester (30.3%). Those who were in their first trimester of pregnancy was least in attendance (12.4%).

**Table 4.3:** Frequency Distribution of HIV-Positive Antenatal Attendees According to Gestational Age at Booking

Gestational Age (in weeks)	BMSH	UPTH	Frequency (%) COMBINED
≤ 12 (First Trimester)	12 (13.8)	11 (11.2)	23 (12.4)
13-24 (Second Trimester)	49 (56.3)	57 (58.2)	106 (57.3)
25-36 (Third Trimester)	26 (29.9)	30 (30.6)	56 (30.3)
<b>TOTAL</b>	<b>87 (100)</b>	<b>98 (100)</b>	<b>185 (100)</b>

Table 4.4 depicts the frequency distribution of the HIV-positive expectant mothers according to anaemia (PCV < 30%) and Non-Anaemic (PCV ≥ 30%) status. A total of 7(3.8%) of the HIV-positive expectant mothers were anaemic (PCV<30%). Four (4.6%) of the seven anaemic

HIV-positive expectant mothers were at BMSH while 3(3.1%) of the HIV-positive expectant mothers were at UPTH. There is no significant difference in the number of anaemic HIV-positive expectant mothers at both hospitals ( $P>0.05$ ).

**Table 4.4:** Frequency Distribution of HIV-Positive Expectant Mothers According to Anaemic (PCV < 30%) and Non-Anaemic (PCV ≥ 30%) Groups

Anaemic Status	BMSH(n=87)	UPTH(n=98)	Frequency (%) Combined(n=185)
Anaemic (PCV<30%)	4 (4.6)	3 (3.1)	7 (3.8)
Non-Anaemic (PCV≥30%)	83 (95.4)	95 (96.9)	178 (96.2)

Table 4.5 shows the frequency distribution of the HIV-positive expectant mothers according to ABO and Rhesus Blood Group phenotypes at both UPTH and BMSH. At both hospitals, the ABO blood groups distribution was as follows, O 115 (62.2%), A 47 (25.4%), B 18 (9.7%) and AB 5 (2.7%).

Analysis of the Rhesus blood group gave the following distribution pattern: O positive 60.0%

(n=111), O negative 2.2% (n=4); A positive 23.2% (n=43), A negative 2.2% (n=4); B positive 9.2% (n=17), B negative 0.5% (n=1) and AB positive 1.6% (n=3), AB negative 1.1% (n=2). These gave a total of 174 (94.0%) to be Rhesus “D” positive while 11 (6.0%) to be Rhesus “D” negative.

Chi-Square test results showed no significant difference in the distribution of HIV status among

the expectant women of different ABO and Rhesus blood types [ $\chi^2=5.387$ ,  $df=7$ ,  $P=0.364(P>0.05)$ ]. The differences merely reflect the population frequencies of those blood groups.

The cross tabulation of the Rhesus positive and negative individuals showed no association with HIV status.

**Table 4.5:** Frequency Distribution of HIV-Positive Expectant Mothers According to ABO and Rhesus Blood Group Phenotypes at both UPTH and BMSH

Blood Groups	BMSH (n=87)	UPTH (n=98)	Frequency (%) Combined (n=185)
A Rh 'D' Positive	18(20.7)	25(25.5)	43 (23.2)
A Rh 'D' Negative	3 (3.4)	1 (1.0)	4 (2.2)
B Rh 'D' Positive	7 (8.0)	10 (10.2)	17 (9.2)
B Rh 'D' Negative	1 (1.2)	0 (NIL)	1 (0.5)
AB Rh 'D' Positive	1 (1.2)	2 (2.0)	3 (1.6)
AB Rh 'D' Negative	1 (1.2)	1 (1.0)	2 (1.1)
O Rh 'D' Positive	53 (60.0)	58 (59.2)	111 (60)
O Rh 'D' Negative	3 (3.4)	1 (1.0)	4 (2.2)
<b>Total</b>	<b>87 (100)</b>	<b>98 (100)</b>	<b>185 (100)</b>

[ $\chi^2=5.387$ ,  $df=7$ ,  $P=0.364(P>0.05)$ ].

Table 4.6 depicts the frequency distribution of the HIV-positive mothers according to haemoglobin (Hb) types (Hb electrophoretic pattern). Haemoglobin A (HbAA) constitute the most

frequent type (79.0%), followed by Haemoglobin AS (19.5%). Only one of the HIV positive women representing 0.5% had haemoglobinopathy (HbSS).

**Table 4.6:** Frequency Distribution of HIV-Positive Mothers According to Haemoglobin (Hb) Types (Hb Electrophoretic Pattern)

Hb Types	BMSH (n=87)	UPTH (n=98)	Frequency (%) Combined (n=185)
AA	67(77.0)	79 (80.6)	146 (78.9)
AS	19 (21.8)	17 (17.4)	36 (19.5)
AC	1 (1.2)	1 (1.0)	2 (1.1)
SS	NIL	1 (1.0)	1 (0.5)
<b>Total</b>	<b>87(100)</b>	<b>98 (100)</b>	<b>185(100)</b>

( $\chi^2=6.748$ ,  $df=3$ ,  $P=0.431$ ).

Table 4.7 depicts the prevalence of HIV-seropositivity among the HIV exposed babies at both UPTH and BMSH. A total of 14 babies representing 7.57% (14/185) were seropositive for HIV-1. This gave a total mother to child transmission rate of 7.57%. Five (5) of the 14

babies representing 5.75% were at BMSH while the remaining 9(9.18%) were at UPTH. Student t-test did not show significant difference at both hospitals ( $P>0.05$ ). One hundred and seventy-one (171) (92.43%) were HIV negative (82 at BMSH and 89 at UPTH).

**Table 4.7:** Prevalence of PCR-DNA HIV-positivity Among HIV-exposed Babies at both UPTH and BMSH

Study Site	Total Number of HIV Positive Mothers	Number of HIV Positive Babies	Number of HIV-Negative Babies
BMSH	87	5(5.75%)	82 (94.25%)
UPTH	98	9 (9.18%)	89 (90.82%)
<b>Total</b>	<b>185</b>	<b>14 (7.57%)</b>	<b>171 (92.43%)</b>

( $P>0.05$ )

Table 4.8 outlines the prevalence of the HIV-positive babies (PCR-DNA positive babies) according to mothers' gestational age at booking.

The majority of the PCR-DNA positive babies, 9(16.1%) were from the HIV-positive mothers who booked at the third trimester of pregnancy and

commenced antiretroviral therapy. This was followed by those who booked at the second trimester of pregnancy, 5(4.7%). There were no PCR-DNA positive babies delivered by the mothers who booked at the first trimester of pregnancy (0%) with commencement of antiretroviral therapy. All the PCR-DNA positive babies were tested at six (6) weeks of postnatal life. During this period, each baby was on 5ml daily dose of triple regimen syrup

and was exclusively breastfed. All the mothers were on 300mg daily dose of triple regimen from the day of booking up to the date of baby sample collection. The triple regimens consisted of Efavirenz, Lamivudine and Tenofovir. There was a statistically significant difference between the gestational age at booking and HIV-1 infection in the babies ( $\chi^2=7.113, df=2, P<0.05$ ).

**Table 4.8:** Prevalence of HIV-Positive Babies (PCR-DNA Positive Babies) According to Mothers Gestational Age at Booking

Gestational Age (in weeks)	BMSH	UPTH	Frequency (%) COMBINED
≤ 12 (First Trimester)	NIL n=12	NIL n=11	NIL n=23
13-24 (Second Trimester)	1 (2.0) n=49	4(7.0) n=57	5(4.7) n=106
25-36 (Third Trimester)	4(15.4) n=26	5(16.7) n=30	9(16.1) n=56
<b>Total</b>	5(5.8) n=87	9(9.2) n=98	14(7.7) n=185

( $\chi^2=7.113, df=2, P<0.05$ ).

Table 4.9 highlights the frequency distribution of the HIV-positive babies according to gender. Six (42.9%) of the total PCR-DNA positive babies were males, whereas, the remaining 8 representing

57.1% were females, giving a male to female ratio of 1.0:1.3. Thus, slightly more females were infected than males. However, this was not statistically significant ( $P>0.05$ ).

**Table 4.9:** Frequency Distribution of HIV-Positive Babies According to Sex

Sex	BMSH (n =5)	UPTH (n = 9)	Frequency (%) Combined (n = 14)
Male	3 (60)	3 (33.3)	6 (42.9)
Female	2 (40)	6 (66.7)	8 (57.1)
<b>Total</b>	5 (100)	9 (100)	14 (100)

( $P>0.05$ )

Table 4.10 shows the frequency distribution of the HIV-positive babies (PCR-DNA positive babies) in relation to blood groups. Almost all the PCR-DNA positive babies belong to blood group O Rhesus (D) positive (92.9%) at both hospitals,

except for one baby (7.1%) who belongs to blood group A Rhesus (D) positive at BMSH. There was no association between the babies' blood groups and HIV positivity (Student T-test =1.547;  $P=0.468$ ).

**Table 4.10:** Frequency Distribution of PCR-DNA HIV-Positive Babies According to ABO and Rhesus Blood Group Phenotypes

Blood Group (n=5)	BMSH (n=9)	UPTH (n=14)	Frequency (%) Combined
A Rh 'D' Positive	1 (20)	NIL	1(7.1)
A Rh 'D' Negative	NIL	NIL	NIL
B Rh 'D' Positive	NIL	NIL	NIL
B Rh 'D' Negative	NIL	NIL	NIL
AB Rh 'D' Positive	NIL	NIL	NIL
AB Rh 'D' Negative	NIL	NIL	NIL
O Rh 'D' Positive	4 (80)	9 (100)	13 (92.9)
O Rh 'D' Negative	NIL	NIL	NIL
<b>TOTAL</b>	5 (100)	9 (100)	14 (100)

Student T-test=1.547;  $P=0.468$

Table 4.11 demonstrates the frequency distribution of the HIV-positive babies according to haemoglobin (Hb) types (Hb electrophoretic patterns). Eighty five point seven percent (85.7%) of the HIV PCR-DNA positive babies had haemoglobin A (HbAA) at both UPTH and BMSH,

**Table 4.11:** Frequency Distribution of HIV-Positive Babies According to haemoglobin (Hb) types (Hb Electrophoretic Pattern)

Hb Types (n=5)	BMSH (n=9)	UPTH (n=14)	Frequency (%) Combined
AA	4 (80)	8 (88.9)	12 (85.7)
AS	1 (20)	1 (11.1)	2 (14.3)
AC	NIL	NIL	NIL
SS	NIL	NIL	NIL
Total	5 (100)	9 (100)	14 (100)

(Student T-test=1.647; P=0.558)

All the babies were delivered vaginally except for two that were delivered by caesarean section (CS). Following the delivery, all the HIV exposed babies were immediately placed on 5ml daily dose of Triple Regimen Antiretroviral prophylaxis and was exclusively breastfed until the time of blood sample collection at 6 weeks for HIV DNA-PCR analysis. Hitherto, each of the mothers was on 300mg daily dose of Triple Regimen Antiretroviral therapy with multivitamin from the day of booking until the day of baby blood sample collection.

**Discussion/Conclusion**

In this study the overall prevalence of the HIV-1 disease among the ante-natal attendees is 4.34% (Table 4.1) and the prevalence of vertical transmission is 7.57% (Table 4.7), this finding can serve as a reference point in monitoring the progression of the disease in the state. All the pregnant women were only positive for HIV-1, no HIV-2 sero-positive is seen amongst the women under study collaborating the fact that HIV-2 is not prevalent in this locality. This discovery connotes the fact that HIV disease is still a leading health challenge among the women in their reproductive years and children in Port Harcourt, Nigeria. Sexual unfaithfulness among the spouse, ignorance of risk of HIV infection in pregnancy, ignorance or neglect of intervention measures, ignorance of presence of the disease, poverty in

whereas only 2(14.3%) of the babies had haemoglobin AS electrophoretic pattern (AS genotype). None of the HIV-positive babies had abnormal haemoglobin type. There is no association between haemoglobin type and HIV-positivity (Student T-test=1.647; P=0.558).

the society, non-compliance of preventive measures, are possible reasons for this present prevalence rates.

To some extent, this 4.34% prevalence rate reported in this study is shocking when put side by side with the 15.2% prevalence rate given to Rivers State<sup>[5]</sup> and NACA (2016). Although this study may not cover the whole of Rivers State, University of Port Harcourt Teaching Hospital (UPTH) and Braithwaite Memorial Specialist Hospital (BMSH) are the biggest hospitals with great number of pregnant women in this state. The two hospitals gave prevalence rates of 4.53% in UPTH and 4.14% in BMSH which is far from the reported data by WHO and NACA.

A study conducted by<sup>[12]</sup> in Obio Cottage Hospital Rumuobiakani, Port Harcourt gave 3.0% for HIV prevalence rate, this report is similar to this present finding. Another study done in Yenagoa, Bayelsa State<sup>[13]</sup> reported 4.1% HIV prevalence rate which is also similar to this finding. But this 4.34% prevalence rate is lower to another report done by<sup>[14]</sup> which came up with 11.0% prevalence rate. However, the 4.34% prevalence rate discovered in this study is higher than those reported by Suresh *et al.*, (2016), 0,3% in India<sup>[13]</sup> 2.4% in Sokoto State and<sup>[15]</sup> 0.8% in Nsukka, Nigeria. The different reports given as prevalence rates indicates that prevalence rates vary according to geographical location among the ante-natal attendees in this country or elsewhere.



As regards, the distribution of the HIV according to the maternal age brackets, this current study discovered that ages (28 – 34) years have the highest prevalence of 59.5% Table 4.2, the reason behind this is that this age bracket are more sexually active, and make up to 70% of the pregnant women globally. This finding is in agreement with many other studies in Nigeria<sup>[16][17]</sup> and elsewhere in Africa<sup>[18]</sup>. The age bracket (14 – 20) years had the least number of sero-prevalence 1.6%, this does not agree with a previous 4.2% finding amongst ages between 15 and 24 years carried out in North-West Nigeria by<sup>[17]</sup>. This finding is also in variance with the report of<sup>[19]</sup> in Edo State who found the highest HIV prevalence of 17.9% among the 10-20 years age group. This relatively lower seroprevalence rate in this study among the younger age group is in tandem with normal distribution pattern usually reported in generalized epidemic. This discovery is in line with an earlier study in Tanzania<sup>[18]</sup> and in Ethiopia<sup>[20]</sup>. The age distribution of the mothers did not affect HIV seropositivity in this work. All the age brackets experienced the HIV disease.

Although this study did not analyse the possible reasons for the late ante-natal booking, these reasons may include lack of finance, not knowing the right time for ante-natal booking, lack of education on the benefit of early ante-natal booking, lack of approval for registration from the spouse, long distance from the hospital, tight work schedule, apparently healthy pregnancy and incessant strikes by the health workers amongst others<sup>[21]</sup>.

This study has shown that timing of antenatal booking has not changed over the years as compared to what is obtainable in developed countries. Therefore, women in this part of the world should be constantly re-educated and informed on the benefit of early antenatal booking and that every single pregnancy is different from the other and unexpected unfavourable outcome may happen despite previous unchallenging pregnancies<sup>[22]</sup>.

In terms of ABO blood groups distribution, the HIV positive antenatal attendees in this study had blood group O as the most dominant blood group 62.2%, and this is in line with earlier findings other parts of the country Nigeria<sup>[23][24][25]</sup> and elsewhere<sup>[26][27]</sup>. The discovery of this work may therefore suggest that blood group O persons are naturally more prone to the HIV infection, but further analysis in this area will throw more light on the time association between the blood group O individuals and the CD4 densities the chemokine co-receptors, cytokines and other antigenic determinants such as P<sup>k</sup> as higher or lower densities of these receptors on the cell membranes of blood group O individuals would suggest possible susceptibility or resistance.

The 25.4% prevalence of blood group A in this analysis is different from the 42.1% given among HIV-positive infants in Sokoto, North Western Nigeria and also the 44.9% found among HIV positive blood donors in Tehra-Iran<sup>[28]</sup>. However the value of this study is in congruence with the reports of<sup>[23][24][25]</sup>.

The 9.7% prevalence of blood group B among the HIV positive antenatal women in this study is similar to the 9.4% obtained in the study conducted among HIV positive infants in Sokoto. In comparison the rate obtained in this analysis is lower than some values recorded in some other similar studies<sup>[23][24][25]</sup>. Blood group AB was the least prevalent (2.7%) in this analysis and this is in accordance with some earlier reports<sup>[24][25]</sup>. As usual, the rates vary from place to place.

The 79.0% prevalence of AA is more than the reference range of 55%–75% formerly given for Blacks. Whereas the prevalence of AS in this study (19.5%) is similar to the reference value of 20%–30% quoted for Nigeria and the 20%–40% in Africa as a whole.

Nevertheless, the 7.57% MTCT rate obtained in this analysis is higher than what was reported by<sup>[29][30][31][32][33]</sup>. Even though the analysis was similarly conducted in the hospital, the higher rate of the disease transmission can be linked to the

difference in the preventive approach and the situation under which the analysis was carried out. The majority of the PCR-DNA positive babies, 9(16.1%) were from the HIV-positive mothers who booked at the third trimester of pregnancy. This was followed by those who booked at the second trimester of pregnancy, 5(4.7%). There were no PCR-DNA positive babies delivered by the mothers who booked at the first trimester of pregnancy (0%) (Table 4.8). There was a statistically significant difference between the gestational age at booking and HIV-1 infection in the babies ( $\chi^2=7.113$ ,  $df=2$ ,  $P<0.05$ ). This suggests that late booking is a consequence of vertical transmission among HIV positive antenatal attendees on antiretroviral therapy.

The sex distribution of the HIV DNA PCR positive infants in this study is 42.9% for boys and 57.1% for girls (Table 4.9). Giving a boys to girls ratio of 10:13, hence showing slightly more girls are affected than the boys. However, this finding was statistically insignificant ( $P > 0.05$ ).

However, the final clarification in this gender ratio difference comes from the Trivers-Willard hypothesis which propose that if a female finds herself in a low social class it is more beneficial to her to put in more into the child that is less at risk. In our society the reproductive success of a male child is limited by male-male competition and resources, thereby making some males to be highly successful and others not.

In this study a majority 8(57.1%) of the infant that are HIV positive are females and if these infants grow to adulthood; this finding supports the earlier reports that HIV disease is progressively becoming feminized especially in Africa.

In this study, almost all the HIV DNA-PCR positive babies belong to blood group O Rhesus (D) positive (92.9%). However there was no statistically significant association with HIV infection (Student T-test =1.547;  $P=0.468$ ) (Table 4.10).

The prevalence of the haemoglobin types, haemoglobin AA 85.7% and AS 14.3% in this study is not in congruence with the earlier findings of 71.5% and 25.3% respectively as

reported by Buseri and Okonkwo (2014). Whereas <sup>[13]</sup> reported abnormal haemoglobin SC to be associated with HIV positivity, this current study did not find any abnormal haemoglobin among the HIV infected babies. This agrees with the fact that congenital haemoglobin variants appear differently in different population and nationalities around the globe.

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