

## Detection of HIV-1 and -2 Antibodies among Children and Knowledge, Attitude, Perceptions and Practices (KAPP) of Their Parents in Port Harcourt, Nigeria

Iheanyi O. Okonko<sup>1\*</sup>, Tochi I. Cooney<sup>1</sup>, Ifeyinwa N. Chijioke-Nwauche<sup>2</sup>,  
Sofiat Adewuyi-Oseni<sup>1</sup> and Charles C. Onoh<sup>3</sup>

<sup>1</sup>Virus Research Unit, Department of Microbiology, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

<sup>2</sup>Department of Clinical Pharmacy and Management, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

<sup>3</sup>Department of Health Services/Public Health Unit, Federal University of Technology, Owerri, Nigeria.

### Authors' contributions

This work was carried out in collaboration among all authors Author IOO designed the study and wrote the protocol. Author TIC, CCO and INCN managed the laboratory analyses and performed the statistical analysis of the study. Author IOO managed the literature searches and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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### ABSTRACT

**Aim:** Paediatric testing for HIV in low-income and middle-income countries is poor and must be raved up as this is important for treatment and survival among this disease-prone demographic area. This study was carried out to detect the presence of HIV-1 and -2 antibodies among children receiving health care service in the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Rivers State, Nigeria. It also aimed to assess the knowledge, attitude, perceptions and practices of their parents on HIV/AIDS in Port Harcourt, Nigeria.

**Study Design:** Cross-sectional study.

\*Corresponding author: Email: [iheanyi.okonko@uniport.edu.ng](mailto:iheanyi.okonko@uniport.edu.ng);

**Place and Duration of Study:** University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Nigeria, between August 2012 and July 2015.

**Methods:** One hundred subjects (58 males and 42 females) were used in this study. Blood samples were collected randomly from children in the outpatient department of the hospital. HIV-1/2 was detected using Gen Screen™ ULTRA HIV Ag-Ab Kit (BIO-RAD), an ELISA based test kit following the manufacturer's instructions.

**Results:** The overall prevalence was found to be 5.0%. The gender-specific infection rate shows that males had a higher infection rate (5.2%) for HIV infection than their female counterparts (4.8%). The age-specific prevalence showed that the children in age groups 8-10 years had a higher prevalence (6.7%) than those 2-4 years (4.5%) and 5-7 years (4.2%). None appeared to be significantly associated ( $P>0.05$ ) with HIV-1/2 antibodies prevalence among the children population. The knowledge, attitude, perceptions and practices of parents of the children indicate that 100.0% of them believed HIV/AIDS is real and children live with it; 62.0% have been screened for HIV before while 38.0% have not; 77.0% believe HIV cannot be cured while 19.0% believe it can; 66.0% know that it can be transmitted from mother to child whereas 16.0% believe it cannot and 70.0% confirmed they share sharp objects.

**Conclusion:** This study however further confirmed the presence of HIV-1 and 2 antibodies among Children in Port Harcourt, Nigeria. HIV can affect all age groups, both males and females. Health education campaigns and training on HIV prevention and control is recommended.

*Keywords: HIV; outpatients; ELISA; seropositivity; children.*

## 1. INTRODUCTION

HIV infection and AIDS became a global epidemic since the 80s, with 37.9 million persons existing with the disease as of 2019 globally [1]. Nigeria having the second largest HIV epidemic in the world with a prevalence of 1.3% which is much less than South Africa and Zambia 19.0% and 11.5% respectively in the sub-Saharan Africa region [1,2].

As at 2019, 1.9 million Nigerians live with HIV [2]. Presently, six states in Nigeria account for 41% of persons existing with HIV, including Kaduna, Akwa Ibom, Benue, Lagos, Oyo, and Kano [1,3]. HIV occurrence is highest in southern states of Nigeria (well-known as the South-South Region), and this stood at 5.5%. It is lowest in the southeast (well-known as the South East Region) where there is a prevalence of 1.8%. There are higher rates of HIV cases in rural areas of Nigeria (4.0%) than in urban ones (3.0%) [3,4].

Approximately 53,000 persons died as a result of AIDS-related illnesses in Nigeria in 2019 [1,3]. NACA [5] documented that less than 500,000 of about 1.66 million who required antiretrovirals (ARVs) were receiving them. Since 2005, the decrease in annual AIDS-related deaths has been minimal, indicative of the fact that only 30.0% of those diagnosed as seropositive in Nigeria are accessing antiretroviral treatment (ART) [1,3].

In Nigeria, children within 0-14 years accounted for the 220, 000 cases of HIV in 2019 [2]. Unfortunately, more than 50.0% of these cases were not on antiretroviral treatment (ART) [2]. Universally, there has been a little less than 50% reduction in the new cases of HIV infection in children yearly since 2010. [6]. Within 1995 and present, over 1.6million new cases of HIV infection in children were seized, as a result of antiretroviral medicines (ARVs) administered to pregnant and breastfeeding women living with HIV to prevent mother-to-child transmission (MTCT).

Between 2010 – 2015, 1.3 million of these cases were prevented [7]. About 26.9% of all mother-to-child-transmission (MTCT) cases of HIV worldwide occurred in Nigeria [8] with an estimated 32% of the infected pregnant women receiving ARTS and only 34.7% of pregnant women tested for HIV during antenatal [8-9]. As a result, the preponderance of MTCT has remained high (an estimate of 22.0%) since 2016 [8].

In 2017, an estimated 1.8 million children were orphaned by AIDS, which can have a huge impact on their health, safety and wellbeing [2]. Around 20% of orphans and vulnerable children do not attend school regularly and around 18% are sexually abused [10]. HIV also has an indirect impact on children in Nigeria, whereby often they become caregivers for parents who are living with HIV. Normally, this responsibility

lies with girls rather than boys and can contribute to the imbalance in schooling between the two genders in Nigeria, with girls missing out on HIV education that could teach them how to protect themselves from infection [10].

Regular HIV testing, treatment, monitoring and care for children living with HIV can enable them to live long and fulfilling lives. However, a lack of necessary investment and resources for adequate testing, pediatric ARVs and child-friendly prevention programmes mean children continue to suffer the consequences of the epidemic. This study was designed to determine the seroprevalence of HIV infection among children in Port Harcourt, Rivers State, Nigeria. It also aimed to assess the knowledge, attitude, perceptions and practices of their parents on HIV/AIDS in Port Harcourt, Nigeria. Also, suggest possible ways of preventing and controlling the spread of HIV.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

This study was performed using HIV positive patients attending the University of Port Harcourt Teaching Hospital (UPTH) located at Alakahia along East-West road, Obi-Akpo Local Government Area of Rivers State, Nigeria. Port Harcourt, is found along the Bonny River in the Niger Delta region of Nigeria with its Coordinates: 4°53'23"N and 6°54'18"E. Port Harcourt metropolis consists of Obio/Akpor Local Government Area and Port Harcourt Local Government Area [11], which encompass largely of Ikwere ethnic with several other ethnic groups from all around Nigeria. According to census 2006 report, Port Harcourt city local government area and Obio/Akpor local government area have populations of 1,382,592 and 878,890 respectively [12] and a landmass of 360 km<sup>2</sup> and 260 km<sup>2</sup> respectively.

### 2.2 Study Design

This is a cross-sectional study involving a cohort of 100 children attending the University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Nigeria. blood withdrawal by venipuncture and screening for HIV and recording of demographic information such as the age and sex of the participants.

### 2.3 Determination of Sample Size for the Study

The sample size for this study was determined using the established formula [13-14]:  $N = [Z^2(PQ)]/d^2$ . Where N is the desired sample size. Z = standard normal deviation at a 95% confidence interval (which was 1.96). p = proportion of target population (prevalence estimated at 6.0%, reported for Rivers State as at HIV Sentinel Survey of 2010); this implies  $6.0/100 = 0.06$ . q = alternate proportion (1-p), which was calculated as:  $1 - 0.06 = 0.94$ . d = desired level of precision (degree of precision/significance). This was taken as 0.05. Then, the desired sample size (N) = 87. Hence, the estimated sample size was 87 individuals with an additional 10.0% sample (which is 8.7) to take care of study participants that may be lost to follow-up [13-14], providing a total sample size of 96 approximated to 100 from each of hospital.

### 2.4 Study Population

The study population comprised one hundred (100) children accessing care at the University of Port Harcourt Teaching Hospital in Port Harcourt, Nigeria. There were 58 males and 42 females [Table 1]. Blood samples were collected from the 100 children of different ages and sex, who visited the hospital with one or more of the complaints. The demographic details relevant to the study were obtained.

### 2.5 Inclusion and Exclusion Criteria

All children were eligible for the study. Both males and female children between age 2-10 years were included in the study. Children who were duly registered in the registration book were included, whereas children who had incomplete data like age, sex and duplicate records were exempted from the study.

### 2.6 Specimen Selection, Collection and Preparation

The method of sample collection employed was venipuncture technique [15]. About 3 ml of venipuncture blood was collected in EDTA BA Vacutainer TM anti-coagulant tubes (BD, Franklin Lakes, USA). Plasma specimens were separated by centrifugation at 300 rpm (revolution per minute) for 5 min. The plasma was stored at -20°C and used for the laboratory analyses. Specimens were brought to room temperature before testing. The frozen specimen was thawed completely and mixed well before

testing. Specimens were not frozen and thawed repeatedly.

## 2.7 Serological Analysis

Approximately 5ml of venous blood samples were collected from the 100 children and their serum was screened for antibodies to HIV using Determine HIV-1/2, HIV ½ Stat-Pak and Enzyme-Linked Immunosorbent Assay (ELISA) Gen Screen™ ULTRA HIV Ag-Ab Kit (BIO-RAD, France). The instruction of the test kit manufacturer was strictly followed. Plasma was tested at the Virus Research Unit, Department of Microbiology, University of Port Harcourt, for the presence of antibodies to HIV following the respective manufacturer's instructions. HIV testing was done according to the national algorithm recommended by the Federal Ministry of Health of Nigeria. Rapid HIV tests: HIV (1 + 2) rapid test strips (Determine, Alere Co, LTD, Japan) as the screening test; and Stat-Pak (ChemBio Diagnostic Systems, Inc., New York, NY, USA) as a confirmatory test for positive samples. These HIV testing methods were immuno-chromatographic assays. All samples with non-reactive results to HIV kits were considered negative. A commercially available Gen Screen™ ULTRA HIV Ag-Ab Kit (BIO-RAD), was used as a tie-breaker. Positive and negative standard sera, accompanying the kit were included in each assay.

## 2.8 Data Analysis

The seroprevalence was calculated. Chi-square test was used to establish relationships between demographic factors and prevalence using SPSS version 21 (IBM) and Microsoft Excel spreadsheet (Microsoft Corporation). Significance level was set at  $P \leq 0.05$ .

## 3. RESULTS AND DISCUSSION

### 3.1 Results

#### 3.1.1 Seroprevalence of HIV among children

The overall prevalence was found to be (5.0%,  $n=5/100$ ). The characteristics of the children are shown in Table 1 and 2 along with values for the age- and sex-related prevalence. The gender-specific infection rate shows that males had a higher infection rate (5.2%,  $n=3/58$ ) for HIV infection than their female counterparts (4.8%,  $n=2/42$ ) [Table 1].

**Table 1. Seroprevalence of HIV among children in Port Harcourt, Rivers State, Nigeria in relation to sex**

Sex	No. tested	No. positive (%)
Males	58	3 (5.2)
Females	42	2 (4.8)
Total	100	5 (5.0)

The age-specific prevalence showed that the children in age groups 8-10 years had higher prevalence (6.7%,  $n=2/30$ ) than those 2-4 years (4.5%,  $n=1/22$ ) and 5-7 years (4.2%,  $n=2/48$ ) (Table 2).

**Table 2. Seroprevalence of HIV among children in Port Harcourt, Rivers State, Nigeria in relation to age**

Age (years)	No. tested	No. positive (%)
2-4	22	1 (4.5)
5-7	48	2 (4.2)
8-10	30	2 (6.7)
TOTAL	100	5 (5.0)

#### 3.1.2 Knowledge, attitude and practices of parents of the children

One hundred per cent of parents agree that HIV/AIDS is real, 62.0% have been screened of HIV, 38.0% have not, 19.0% said HIV/AIDS is curable, and 4.0% don't know if it is curable or not. Thirty-three per cent (33.0%) said HIV/AIDS can be transmitted from infected pregnant woman to her unborn child, 16.0% said the virus cannot be transmitted and 18.0% don't have an idea of it. One hundred per cent (100.0%) agree that children are living with HIV/AIDS. Thirty per cent (30.0%) share sharp objects while 70.0% don't. Twenty-two per cent (22.0%) said they are at risk of contracting HIV/AIDS while 78.0% said they are not at risk. All these records are presented in Table 3.

### 3.2 DISCUSSION

Paediatric testing for HIV in low-income and middle-income countries is poor and must be raved up as this is important for treatment and survival among this disease-prone demographic area. The result from this study shows that the overall HIV prevalence among the children accessing health care service at the University of Port Harcourt Teaching Hospital in Port Harcourt (UPTH), Nigeria was 5.0%. The result of this study is close to the HIV prevalence of 4.2%

**Table 3. Knowledge, attitude, perceptions and practices of parents of children in Port Harcourt, Nigeria**

<b>Variables</b>	<b>No. (%)</b>
<b>Is HIV/AIDS real?</b>	
Yes	100.0
No	0.0
<b>Have you been screened of HIV?</b>	
Yes	62.0
No	38.0
<b>Is HIV/AIDS curable?</b>	
Yes	19.0
No	77.0
Don't know	4.0
<b>Can HIV/AIDS be transmitted from an infected pregnant woman to her unborn child?</b>	
Yes	66.0
No	16.0
Don't know	18.0
<b>Are children living with HIV/AIDS?</b>	
Yes	100.0
No	0.0
<b>Do you share sharp objects?</b>	
Yes	30.0
No	70.0
<b>Are you at risk of contracting HIV/AIDS?</b>	
Yes	22.0
No	78.0
Total	100.0

reported by Venn et al. [16], among infants attending immunization centres in Calabar, Cross River State but higher, although the mean age in that study was  $9.20 \pm 3.1$  weeks while the mean age in this study was 6 years. The prevalence rate in this study was much higher than the 1.0% prevalence reported by Ochigbo et al. [17] among siblings of HIV positive children in Calabar, aged six weeks to 15 years.

The University of Port Harcourt Teaching Hospital being a referral site and the fact that the study was community-based might have accounted for the difference in prevalence. Cohn et al. [18] reported that children presenting to inpatient wards have a higher chance of being HIV positive than healthy children presenting to outpatient settings or not sick at all.

However, this prevalence was much lower than the 10.0% reported by Ogunbosi et al. [19] in a study conducted at University College Hospital, Ibadan. The difference may be attributed to the age bracket covered (one day – 15 years), a larger sample size, six times the sample size of this study (600 patients) and also because age-specific testing for patients aged <18 months (HIV DNA PCR testing) was used in that study as

against the serological testing adopted for all subjects in the present study.

There was a slight preponderance of seropositivity among the male subjects than the female and those aged 8-10 years than among other age brackets but the differences are not statistically significant. Ogunbosi et al. [20] reported that Nigeria has the largest paediatric HIV-infected population in the world. The age demographic captured in this study exclusively includes children who still have ties with their family or caregivers and much likely not to have engaged in sexual or other risky behaviour that might have exposed them to HIV and could be children born to mothers who has missed the opportunities for prevention of mother-to-child transmission of HIV, although the study did ascertain the HIV status of the mothers even though some admitted to having been screened in the past for HIV.

On the knowledge, attitude and practices of parents of the subjects in this study it can be concluded that the parents are knowledgeable about the disease as a preponderance of the respondent agreed that HIV/AIDS is real, can be transmitted from mother to child and through a

sharp object, and they have been screened for HIV. Okonkwo et al. [21] similarly reported a very high knowledge of HIV and routes of transmission among healthy adults in Cross River State, Nigeria within the same south-south region as the study area.

Many HIV-positive children in low- and middle-income countries remain undiagnosed and this creates a log jam for treatment. As reported by Obimbo [22], about 72.0% of eligible children in Africa are not on antiretroviral medicines (ARVs) because they do not know their diagnosis. Although HIV testing in paediatric populations in low-income and middle-income countries outside the context of prevention of mother-to-child transmission programmes is still a challenge particularly for those aged <18 months, serological testing and other portable point-of-care testing systems should be put in place to not miss this important opportunity to identify HIV-positive children.

#### 4. CONCLUSION

The result of this study showed that HIV testing among children accessing health care at the University of Port Harcourt Teaching Hospital in Port Harcourt, Nigeria provides an important opportunity to identify HIV-positive children. Given the high prevalence rate in this study, testing of children should go beyond the traditional entry points of antenatal clinics and maternity wards to other entry points and inpatient wards to ensure efficient and early diagnosis of HIV among children to link them to needed treatment and care. Emphasis on the importance of scaling-up the diagnosis of infants after birth and during breastfeeding even though the implementation of the preventive measure of mother-to-child transmission has been successful. There is the crucial need to protect vulnerable children from HIV infection and the challenge of adhering to the treatment of children living with HIV with antiretroviral treatment.

#### CONSENT

The method for this study consists of informed consent, All authors declare that written informed consent was obtained from the patient (or other approved parties) for publication of this study.

#### ETHICAL APPROVAL

Ethical considerations and approval for the study was sorted from the Hospital Research Ethics committee of University of Port Harcourt

Teaching Hospital (UPTH) and the University of Port Harcourt Research Ethics Committee following the ethics for research involving human subjects This study was carried out in line with the World Medical Association (WMA) Declaration of Helsinki on the principles for medical research involving human subjects, animal subjects and identifiable human/animal material/data.

All authors hereby declare that all experiments have been examined and approved by the Hospital Research Ethics Committee of University of Port Harcourt Teaching Hospital (UPTH) And University Research Ethics committee of University of Port Harcourt, Nigeria and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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