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HIV-1 and -2 Antibodies among Children in Anyigba, Kogi State, Nigeria

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Abstract: This study was carried out to determine the seroreactivity of blood of children attending Kogi Diagnostic and Reference Hospital, Anyigba to HIV-1/2 peptides and to evaluate some of the children's demographic variables that are associated with anti-HIV-1/2 antibody positivity. We consecutively selected and screened 100 male and female children (aged ≤16 years). Blood sample of each child was screened for HIV-1/2 antibodies using Chembio HIV-1/2 Stat-Pak® and Abbott Determine HIV-1/2® test kits. Only participants that were sero-reactive to the two test kits were identified as seropositive for HIV-1/2 antibodies. The results showed a prevalence rate of 10.0% (n = 100). Risk factors for HIV infection like age, gender, and tribal marks appeared not significantly associated with anti-HIV-1/2 antibody positivity among the children (P = 0.142, P = 0.463 and P = 0.812, respectively). Conclusively, there was no sufficient evidence that age, gender and tribal marks were associated with positivity of HIV-1/2 antibodies among the children studied. This study has been able to add to the information on prevalence of HIV-1/2 antibodies among children in Anyigba, Kogi State, Nigeria. Education of children on HIV and AIDS should continue.

Key words: Children, HIV-1/2 antibodies, risk factors, seropositivity, Nigeria

INTRODUCTION

HIV and AIDS are global catastrophe, the biggest plague, and the worst Tsunami in human history. The United Nations has called HIV and AIDS the most devastating disease that mankind has ever faced (UNAIDS, 2005). The pandemic of HIV infection ranks among the greatest infectious disease scourges in history (WHO, 2005). The HIV epidemic continues to be a burden globally and presents serious public health problems in developing countries, especially in Nigeria. Globally, since the beginning of the epidemic, almost 60 million people have been infected with HIV and 25 million people have died of HIV-related causes (UNAIDS/WHO, 2009). In 2008, some 33.4 million people were living with HIV, 2.7 million new infections and 2 million AIDS-related deaths occurred. In 2008, around 430 000 children were born with HIV infection, bringing to 2.1 million the total number of children under 15 years living with HIV. Young people account for around 40% of all new adult (≥15 years) HIV infections worldwide (UNAIDS/WHO, 2009).

The sub-Saharan Africa remains the region most heavily affected by HIV and AIDS than any other region

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of the world, accounting for over two thirds (67%) of all people living with HIV worldwide and for nearly three quarters (72%) of AIDS-related deaths in 2008; and 91% of all new infections among children (UNAIDS/WHO, 2009). Currently, an estimated 1.9 million people were newly infected with HIV in sub-Saharan Africa in 2008, bringing to 22.4 million people living with HIV in the region - around two thirds of the global total. In sub-Saharan Africa the epidemic has orphaned more than 14 million children (UNAIDS/WHO, 2009). In 2008, around 1.4 million people died from AIDS in sub-Saharan Africa. Since the beginning of the epidemic, more than 14 millionchildren have lost one or both parents to AIDS (UNAIDS/WHO, 2009; Avert, 2010). In deed, HIV and AIDS threaten the fabric of society, increasingly targeting the poor and underprivileged.

In Nigeria, the first case of HIV and AIDS in Nigeria were identified in 1985 in a sexually active 13 year-old girl and reported at an international AIDS conference in 1986 (UNAIDS, 2004; Adeyi *et al*., 2006). Since then the epidemic has grown steadily with adult HIV prevalence increasing from 1.8% in 1991, to 3.8% in 1993, 4.5% in 1996, 5.4% in 1999, 5.8% in 2001, but declined non-significantly to 5.0% in 2003 (Sofo *et al*., 2003; FMoH, 2006; Alikor and Erhabor, 2005; UNAIDS, 2008; Avert, 2010). Current projections show an increase in the number of new AIDS cases from 250,000 in 2000 to 360,000 by 2010. As a result of the epidemic, the crude death rate in Nigeria was about 20 percent higher in 2000 than in 1990. In 2001 alone, 170,000 adults and children died of AIDS. At the end of 2001, UNAIDS estimated that 1 million children orphaned by AIDS were living in Nigeria (USAIDS/WHO, 2009).

HIV and AIDS pandemic is having a ruinous effect on the reproductive health of women in Nigeria especially, pregnant women pose a special risk in transmitting the infection to their fetuses or infants during pregnancy, labour or breast feeding (WHO, 2003). More than 90% of pediatrics HIV infection (aged≤15 years) were attributed to mother-to-child transmission of HIV (Lee *et al*., 1998). The high prevalence of mother-to-child transmission of HIV is threatening. The vast majority of these children have been infected with HIV during pregnancy, childbirth or breastfeeding, as a result of their mother being infected with the virus (Avert, 2010) or increased lifetime number of medical injections (Mann *et al*., 1986b). Thus, there is urgent need to combat this disease in order to give our children a better, brighter future.

Nigeria's epidemic is also characterized by one of the most rapidly increasing rates of HIV and AIDS cases in West Africa (USAID, 2010). Several factors have contributed to the rapid spread of HIV in Nigeria. These include sexual networking practices such as polygamy, a high prevalence of untreated sexually transmitted infections (STIs), low rate of condom use, poverty, low literacy level, poor health status and low economic status of women, stigmatization, and denial of HIV infection among vulnerable groups. Nigeria is a complex mixture of diverse ethnic groups, languages, cultural practices, religions, and regional political groupings, all of which are major challenges for HIV prevention programs (Pennap *et al*., 2006; CDC, 2006; USAIDS/WHO, 2009; USAID, 2010). Also, lack of accurate information about sexual health has contributed to spread of myths and misconceptions about sexual intercourse and HIV, thereby contributing to increasing transmission rates, as well as, stigma and discrimination towards people living with the virus (UNAIDS, 2008; Avert, 2010). Another contributing factor to the spread of HIV in Nigeria is the distinct lack of voluntary and routine HIV testing in most places especially the rural areas (UNGASS, 2007; WHO/UNAIDS/UNICEF, 2008). Cultural practices, poor healthcare system, sexual health clinics providing contraception, testing and treatment for other STDs are also few (Sofo *et al*., 2003). This makes it particularly difficult to keep the spread of the epidemic under control.

HIV consists of genomic RNA molecule protected by a capsid and an outer envelope containing integral viral proteins, the latter serve as the major target for humoral antibody response in infected human. The presence of the virus in patients causes the immune system to produce HIV-specific antibodies. The *in-vitro* detection of these antibodies using synthesized HIV-1/2 peptides has been used as diagnostic tool. The least expensive means of knowing one's HIV serostatus is by testing human blood samples for the presence of HIV-1/2 specific antibodies (WHO, 2004b). Such testing has been used for surveillance study of HIV infection globally which provides invaluable epidemiological data for health planning/ programme regarding HIV and AIDS (WHO, 2004b). ELISAs, western Blots, PCR-based assays and various other test systems are currently available for HIV-1/2 detection (Essex *et al*., 1990; Kovacs *et al*., 1995; CDC, 2005). In this regard, rapid HIV serodiagnosis which is less costly, with reduced turnaround time is especially suitable. Some rapid kits have therefore been recommended by FDA/USAID to screen large number of individuals providing test results in less than 20 min or within one hour (WHO, 2004b; CHHS, 2006). This mode of testing is especially beneficial in resource-constrained countries, like Nigeria. Many rapid HIV test kits in strips or cartridges are easy to handle and can yield high quality rapid test results comparable to that of traditional ELISAs (WHO, 1998). WHO gave credence to rapid HIV test by development of testing algorithms showing that sequential combinations of two or three antibody tests (ELISAs and/or rapid tests) can be reliably used to confirm HIV test results (Meda *et al*., 1999). Many rapid immunochromatographic tests such as Chembio HIV-1/2 Stat-Pak Assay and Abbott Determine HIV-1/2® test kits, which are simple and easy to use, utilize immobilized

antigens for the detection of antibodies to HIV-1/2 in serum, plasma or whole blood.

Using these means, various studies have reported the burden of HIV among children in Nigeria and different parts of the world (FMoH, 2004; Alikor and Erhabor, 2005). A review of the HIV sentinel surveys in Nigeria shows that HIV prevalence varied across geopolitical locations in the country (FMoH, 2003; Olaleye *et al.*, 2006; Utulu and Lawoyin, 2007). Generally, adult HIV prevalence of 5.80% was reported for Kogi state during the 2003 sentinel survey (FMoH, 2004). Limitations have been identified in the national HIV data because the rates were based on HIV seroprevalence among pregnant women attending government health facilities, therefore, little is known about HIV infections among paediatric population or among men (FMoH, 2001). Also, information on incidence and prevalence rates among various at-risk populations were not available from the survey (FMoH, 2001). Though HIV-1/2 is spread from infected to uninfected chiefly by sexual intercourse, they can also be spread perinatally and through blood transfusion. HIV-2, however, is less efficiently transmitted compared to HIV-1 (Reeves and Dom, 2002). The investigation conducted by Olaleye *et al.* (1993) and Abimiku *et al.* (1994) showed HIV-1 to be more prevalent in Nigeria. It has also been reported that HIV-1 is more pathogenic and is found in Asia, East and Central Africa, Europe and United States, while HIV-2 is mainly limited to West Africa.

A lot of work has been done in various parts of the world on the extent and magnitude of pediatric HIV infection however; there is paucity of data on pediatric HIV infection in Anyigba, Kogi State, Nigeria. Thus, this study was carried out to determine the seropositivity of HIV-1/2 antibodies among children attending Kogi Diagnostic and Reference Hospital, Anyigba, Kogi State, Nigeria and to evaluate some of the children's demographic variables that are associated with anti-HIV-1/2 antibody positivity.

MATERIALS AND METHODS

Study area: The study was carried out at Kogi Diagnostic and Reference Hospital, Anyigba, Kogi State, Nigeria between May and October, 2008. The hospital is one of the most utilized health facilities in Anyigba. The town has an estimated population of 130,000 comprising of most ethnic groups in Nigeria. The Igala ethnic group dominates the population of Anyigba. The remaining ethnic groups include the Yoruba, Igbo, Hausa, Fulani, Edo, Calabar, Idoma, TIV and others (NPC, 2006). Anyigba, the study area is located on latitude 7º 15′-7º 29′ N and longitude 7º 11′-7º 32′ E and with an average altitude of 420 m above sea level in Dekina Local Government (LGA) of Kogi-East (Ifatimehin *et al.*, 2009). Kogi-East lies approximately between latitude 6º 3′ N and longitude 6º 3′-7º 4′ E past and covers an area of 13,665.61 km^2 (Oguagba *et al.*, 1997). Kogi-East is made up of different LGAs including Dekina, Ofu, Omale, Olamaboro, Idah, Ankpa and others.

Study population and sample collections: The study was carried out among children (aged ≤16 years) attending Kogi Diagnostic and Reference Hospital, Anyigba, Kogi State, Nigeria. Consecutive children visiting the hospital over a 3 months period were recruited into the study starting from August, 2008 to December, 2008. Blood sample of 5 ml was aseptically collected by venipuncture from each of the 100 children. Each blood sample was screened for HIV-1/2 antibodies using two different test kits. All parents/guardians verbally consented that their children be enrolled in the study; the hospital management also approved of the study.

HIV antibodies screening: The screening for HIV antibodies was carried out using Chembio HIV-1/2 Stat-Pak® [sensitivity 100% (129/129) and specificity 100% (207/207)] and Abbott Determine HIV-1/2® test kit (sensitivity 100% and specificity 100%) according to the manufacturers' instructions. A seropositive test means observable seroreactivities in both test kits. Discordant results were recorded as seronegative.

Statistical analysis: The data generated in this study were presented by descriptive statistics. Chi-square statistical test was used to show the associations between patients' variables and anti-HIV-1/2 antibody positivity. $p \leq 0.05$ was used as indicator of statistical significance.

RESULTS

In this study, 10 of the 100 children (mean = 8.4 yrs, range: 0.5-16 yrs) concordantly tested seropositive to HIV-1/2 antibodies, indicating a prevalence rate of 10.0%. There was however, a single discordant result for one of the children whose test was only reactive to one of the test kits. Anti-HIV antibody positivity shown by the children is represented in Table 1-3. There was no statistically significant association between variables like age, sex and tribal/tattoo marks and anti-HIV antibody positivity. Table 1 shows the prevalence rates of HIV-1/2 antibodies among children in relation to age of the subjects. Children aged 9 to 16 years had higher prevalence rate of 14.6% compared to those ≤ 8 years (5.8%). However, there was no statistically significant association ($p = 0.142$) between the HIV antibody positivity and age.

Table 2 shows the prevalence rates of HIV-1 and 2 antibodies among children in relation to gender of the subjects. Female children (12.2%) compared with the

Table 1: Prevalence rates of HIV-1 and 2 antibodies among the children in relation to age

	HIV seroreactivity		
Age (Years)	No. of tested	No. of positive (%)	p-value
<8	52	3 (5.8)	0.142*
9-16	48	7 (14.6)	
Total	100	10 (10.0)	

*: Not Significant

Table 2: Prevalence rates of HIV-1 and 2 antibodies among the children in relation to gender

	HIV seroreactivity		
Gender (Sex)	No. of tested	No. of positive (%)	p-value
Male	51	4 (7.8)	0.463*
Female	49	6 (12.2)	
Total	100	10 (10.0)	

*: Not Significant

Table 3: Prevalence rates of HIV-1 and 2 antibodies among the children in relation to tribal marks

	HIV Seroreactivity		
Tribal Marks	No. of tested	No. of positive (%)	p-value
Yes	23	2 (8.7)	0.812*
No	77	8 (10.4)	
Total	100	10 (10.0)	

*: Not Significant

males (7.8%) were more seropositive to HIV however, the difference was not statistically significant (p = 0.463).

Table 3 shows the prevalence rates of HIV-1 and 2 antibodies among children in relation to tribal marks. Children without tribal marks (10.4%) were more seropositive to HIV compared with those without tribal marks (8.7%); these rates were however, statistically comparable (p = 0.812).

DISCUSSION

In this study, the overall prevalence rate of anti-HIV-1/2 antibody was 10.0% (n = 100) with discordant result for one of the children who tested positive to only one of the two test kits. This study showed a low prevalence rate among the children (10.0%) than what was previously reported (seroprevalence of 31.0%) among pediatrics aged 6-8 years in a tertiary health institution in the Niger Delta region of Nigeria (Alikor and Erhabor, 2005). In the same study by Alikor and Erhabor (2005), an overall prevalence rate of 25.8% among children $\leq$ 16 years in a tertiary health institution in the Niger Delta region of Nigeria was also reported. However, this value is higher than the national sentinel seroprevalence rate of 5.0% reported for children in 2003 (FMoH, 2003), and the overall HIV prevalence of 5.80% reported for Kogi State during the 2003 national sentinel survey (FMoH, 2004).

The prevalence rate reported in this study was also higher than the prevalence rate of 5.0% reported by Shaffer *et al.* (1990) in a similar study among pediatrics children in Zaire, and comparable with the 11% prevalence rate reported by Mann *et al.* (1986a) among children 2-14 years of age at Manayemo hospital, Zaire. In line with the assertion of Alikor and Erhabor (2005), the higher prevalence obtained in this present study compared to what was reported at the national sentinel seroprevalence rate survey may be attributed to the fact that our study was carried out in sub-region of Kogi State. This also points to the fact that pediatrics HIV infection among pediatrics residing in this part of Kogi State of Nigeria is on the increase.

Nigeria's epidemic is characterized as one of the most rapidly increasing rates of HIV and AIDS cases. Review of the HIV sentinel surveys in Nigeria shows that HIV prevalence rate increased gradually from 1.8% in 1991 to 5.8% in 2001 (FMoH, 2004). Adeokun (2006) noted that geographic variations in HIV prevalence may be due to previous hubs of sexually transmitted infections (STIs) or urban development in Nigeria. Equally, review of the HIV national sentinel survey showed that HIV prevalence varied significantly across geopolitical locations as well as between different risk groups in Nigeria (FMoH, 2003; Olaleye *et al.*, 2006; Utulu and Lawoyin, 2007). Motayo *et al.* (2009) reported 28.6% among pregnant women attending antenatal clinic at University College Hospital, Ibadan, Nigeria.

Age, sex and tribal marks have been documented as risk factors for contracting HIV-1/2 (NASCP/FMoH 2002). These three risk factors were studied here; we observed that no one appeared to be significantly associated with HIV-1/2 antibodies prevalence among the study children. Contrary to findings that tribal mark is a risk factor for HIV seropositivity. Our study showed that facial/body marks was not a risk factor for infection. Seventy-seven percent of the participants did not have facial/body marks and proportionately had a higher prevalence of infection by each of this virus. Pennap *et al.* (2010) also in their study on HBsAg found no statistically significant association between age, and presence/absence of facial/body marks with viral infection.

Mother-to-child transmission (WHO, 2003) of HIV-1/2 is a significant mode of spread of these viruses to unborn child. The observation that there was no significant difference in gender prevalence rates among these children might be close to reality, as gender is not likely to influence exposure of unborn child to HIV in infected pregnant mother. As regards presence of tribal marks, though Ogunro et al. (2007) reported association of scarification marks on women with infections like hepatitis C viral infection, presence of tribal marks did not significantly influence anti-HIV-1/2 antibody prevalence among these children. A study with larger sample size in the same hospital might reveal otherwise.

In our study, children aged 9 to 16 years had higher prevalence rate of 14.6% compared to those $\leq$8 years

(5.8%), however, this difference was not statistically significant (p = 0.142). This deviated from what was previously reported; Shaffer *et al.* (1990) reported a statistically significant difference in children less than 6 months of age who had a higher rate of HIV (12.6%) than children 6-11 months old (1.9%) and children 1-13 years old (4.1%). In a similar study, Mann *et al.* (1986b) reported a statistically significant difference in seroprevalence rate of HIV among children under 9 months old and 9-24-month age group.

Also in this study, higher proportion (12.2%) of female than (7.8%) of male population had antibody to HIV-1/2, however, this difference was not significant (p = 0.463). This was in line with the findings of Alikor and Erhabor (2005), who reported no statistically difference in gender prevalence of HIV. Though, most studies have attributed that higher proportion of male than female population had antibody to HIV (FMoH, 2003; Olaleye *et al.*, 2006). Review of the 2003 and previous HIV national sentinel surveillance as well as the study by Olaleye *et al.* (2006) showed a significantly higher HIV infection rate among males than females in different regions and even in communities within the same geographic location in the country (FMoH, 2003; Olaleye *et al.*, 2006). In sub-Saharan Africa region, as worldwide, female population is a key factor in the epidemiology of HIV and AIDS because 50% of all adults with HIV infection are predominantly women infected via heterosexual transmission; furthermore, females are the most severely affected (NASCP/FMoH, 2002; Mitchell and Stephens, 2004; WHO, 2004a). In addition, the prevalence among pregnant women is a good indicator of how the epidemic is progressing among the general or the heterosexually active population (WHO, 2003; EuroHIV, 2005). This is because there is the possibility of significantly reducing the chance of HIV transmission to infants if infected pregnant women were diagnosed before or during pregnancy (Sule *et al.*, 2009b).

Comparatively, HIV rate of 10.0% reported in this subpopulation may be a true reflection of the HIV rates in the population rather than the lower 5.8% reported in the 2003 national sentinel survey and 3.1% in 2007 (UNAIDS, 2008). However, it may be characteristic of the study population which consist mostly of children who visited the hospital on request by the physician due to specific clinical presentations rather than apparently healthy children accessing voluntary counselling and testing. Similar assertion was also made in our previous study on traditional crop farmers in Kogi East, Nigeria (Sule *et al.*, 2009a). The main determinant of childhood infection is the scale and magnitude of HIV infection among adult population (Alikor and Erhabor, 2005).

Conclusively, this study has contributed to the information on the burden of HIV infection among children in Anyigba, Kogi State, Nigeria. And in unison with previous findings, we also found that, though this group recorded anti-HIV-1/2 antibody prevalence; age, gender and tribal mark were not significantly associated with the seropositivity.

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