9

Challenges Associated with the Effective Management of HIV Infection in a Low Income Setting in Sub Saharan Africa: Case Study of Nigeria

Osaro Erhabor et al.*
Blood Sciences Department Royal Bolton Hospital Bolton UK

1. Introduction

Nigeria's size is 923,768 sq km, slightly more than twice the size of California in the US. The terrain is mixed with southern lowlands merging into central hills and plateaus. There are mountains in the southeast, and plains in north. The climate varies with equatorial weather in south, tropical in the centre, and arid in north. The lowest point in Nigeria is the Atlantic Ocean at 0 m. The highest point is Chappal Waddi at 2,419 m. Nigeria is home to one of Africa's most important rivers, the Niger, which enters the country in the northwest and flows southward through tropical rain forests and swamps to its delta in the Gulf of Guinea. Just over 135 million people live in Nigeria, making it the most populated country in Africa.

* Oseikhuemen Adebayo Ejele[1], Chijioke Adonye Nwauche[1], Chris Akani[2], Eyindah Cosmos[2] Dennis Allagoa[2], Edward Alikor A.D.[3], Ojule Aaron C.[4], Hamilton Opurum[4], Orikomaba Obunge[5], Seye Babatunde[6], Nnenna Frank-Peterside[7], Sonny Chinenye[8], Ihekwaba E. Anele[8], Teddy Charles Adias[9], Emmanuel Uko[10], Agbonlahor Dennis E.[11], Fiekumo Buseri I.[11], Zacheus Awortu Jeremiah[11], Wachuckwu Confidence[12], Obioma Azuonwu[12], Abbey S.D.[12], Onwuka Frank[13], Etebu Ebitimi N.[14], Seleye-Fubara D.[14] and Osadolor Humphrey [15]
[1]*Department of Haematology and Immunology, University of Port Harcourt, Nigeria*
[2]*Obstetrics and Gynaecology, University of Port Harcourt, Nigeria*
[3]*Department of Paediatrics, University of Port Harcourt, Nigeria*
[4]*Department of Chemical Pathology, University of Port Harcourt, Nigeria*
[5]*Department of Medical Microbiology and Parasitology, University of Port Harcourt, Nigeria*
[6]*Department of Community Health Medicine, University of Port Harcourt, Nigeria*
[7]*Department of Microbiology, University of Port Harcourt, Nigeria*
[8]*Department of Internal Medicine, University of Port Harcourt, Nigeria*
[9]*College of Health Technology Bayelsa State, Nigeria*
[10]*Department of Haematology University of Calabar, Nigeria*
[11]*Department of Medical Laboratory Science Niger Delta University, Amassoma Bayelsa State, Nigeria*
[12]*Department of Medical Laboratory Science Rivers State University of Science and Technology Port Harcourt Nigeria, Nigeria*
[13]*Department of Biochemistry University of Port Harcourt, Nigeria*
[14]*Department of Anatomical Pathology, University of Port Harcourt Teaching Hospital, PMB 6173, Port Harcourt, Nigeria*
[15]*Department of Biochemistry, University of Benin, Nigeria*

Nigeria is made up of 36 states. Figure 1 show the map of Nigeria. Life expectancy is around 47 years. Birth rate is on average 5.45 per woman. Literacy rate is just over 68%. English is the official language. Hausa, Yoruba, Igbo (Ibo) and Fulani are commonly spoken by the major ethnic groups. Nigeria is composed of more than 250 ethnic groups. The most populous and politically influential ethnic groups includes: Hausa and Fulani 29%, Yoruba 21%, Igbo (Ibo) 18%, Ijaw 10%, Kanuri 4%, Ibibio 3.5%, and Tiv 2.5%. Nigeria is a multi-religious nation. Muslims constitute 50% of the population while Christians constitute 40% while 10% practice their indigenous beliefs. British influence and control over what became Nigeria grew through the 19th century. A series of constitutions after World War II granted Nigeria greater autonomy and eventually independence came on October 1st, 1960. Following nearly 16 years of military rule, a new constitution was adopted in 1999, and a peaceful transition to civilian government was completed. The government faces the daunting task of reforming a petroleum-based economy, whose revenues have been squandered through corruption and mismanagement. In addition, the defusing longstanding ethnic and religious tensions are a priority if Nigeria is to build a sound foundation for economic growth and political stability. Oil-rich Nigeria, long hobbled by political instability, corruption, inadequate infrastructure, high rate of unemployment and poor macroeconomic management and suboptimal health infrastructure is undertaking some reforms under a new reform-minded administration. Nigeria's former military rulers failed to diversify the economy away from its overdependence on the capital-intensive oil sector, which provides 20% of GDP and 95% of foreign exchange earnings, and about 65% of budgetary revenues. The largely subsistence agricultural sector has failed to keep up with rapid population growth. Nigeria is Africa's most populous country - and the country, once a large net exporter of food, now must import food.

Despite being the largest oil producer in Africa and the 12th largest in the world (Energy Information Administration, 2007), Nigeria is ranked 158 out of 177 on the United Nations Development Programme (UNDP) Human Poverty Index (UNDP, 2007). This poor development position has meant that Nigeria is faced with huge challenges in fighting its HIV and AIDS epidemic. In Nigeria, an estimated 3.6 percent of the populations are living with HIV and AIDS (UNGASS, 2010). Although HIV prevalence is much lower in Nigeria than in other African countries such as South Africa and Zambia, the size of Nigeria's population (around 149 million) means that by the end of 2009, there were 3.3 million people living with HIV (UNAIDS,2010). Approximately 220,000 people died from AIDS in Nigeria in 2009 (UNAIDS, 2010). With AIDS claiming so many lives, Nigeria's life expectancy has declined significantly. In 1991 the average life expectancy was 54 years for women and 53 years for men (WHO, 2008).In 2009 these figures had fallen to 48 for women and 46 for men (CIA World Fact book, 2010). The major sources of HIV infection in Nigeria include heterosexual transmission, through unsafe blood transfusion and from mother to child transmission. Approximately 80-95 percent of HIV infections in Nigeria are a result of heterosexual sex (UNGASS, 2010). Factors contributing to this include a lack of information about sexual health and HIV, sexual promiscuity, low levels of condom use, and high levels of sexually transmitted diseases. Women are particularly more vulnerable to HIV. In 2009 women accounted for 56 percent of all adults aged 15 and above living with the virus (UNGASS, 2010). HIV transmission through unsafe blood and blood products accounts for the second largest source of HIV infection in Nigeria (Federal Ministry of Health, 2009). Not all Nigerian hospitals have the technology to effectively screen blood and therefore there is a risk of using contaminated blood. Women and children are particularly at risk as a result of malaria and pregnancy-related anaemia. The Nigerian Federal Ministry of Health have

responded by backing legislation that requires hospitals to only use blood from the National Blood Transfusion Service, which has far more advanced blood-screening technology (Nigeria Exchange, 2008). Each year around 57,000 babies are born with HIV (UNGASS, 2010). It is estimated that 360,000 children are living with HIV in Nigeria, most of who became infected from their mothers (UNGASS, 2010). This has increased from 220,000 in 2007 (UNAIDS, 2008). In Nigeria there is a distinct lack of HIV testing programmes. In 2007, just 3 percent of health facilities had HIV testing and counseling services (WHO, UNAIDS & UNICEF, 2008) and only 11.7 percent of women and men aged 15-49 had received an HIV test and found out the results (UNGASS, 2010). In 2009 there was only one HIV testing and counseling facility for approximately every 53,000 Nigerian adults .This is an indication of how desperately the Nigerian government needs to scale up HIV testing services.

Sex is traditionally a very private subject in Nigeria and the discussion of sex with teenagers is often seen as inappropriate. Attempts at providing sex education for young people have been hampered by religious and cultural objections (Odutolu, 2005). In 2009 only 23 percent of schools were providing life skills-based HIV education, and just 25 percent of men and women between the ages of 15 and 24 correctly identified ways to prevent sexual transmission of HIV and rejected major misconceptions about HIV transmission (UNGASS, 2010). In some regions of Nigeria girls marry relatively young, often to much older men. In North Western Nigeria around half of girls are married by age 15 and four out of five girls are married by the time they are 18 (Erulkar and Bello, 2007). Studies have found that those who are married at a younger age have less knowledge about HIV and AIDS, and are more likely to believe they are low-risk for becoming infected with HIV (Erulkar and Bello, 2007). HIV and AIDS education initiatives need to focus on young married women, especially as these women are less likely to have access to health information (Odutolu, 2005). In sub-Saharan Africa (Brenan et al., 2008) and in other parts of the world, (Barnes et al., 1991) it is estimated that there are 12 to 13 infected women for every infected man. Biological, cultural and socio-economic factors contribute to women's greater vulnerability to HIV/AIDS. Women are four times more at risk of becoming infected with HIV during unprotected vaginal intercourse than men. The vagina's large surface area of susceptible tissue and micro trauma during intercourse makes women more physiologically vulnerable (Nyobi et al., 2008). The synergy between HIV and other sexually transmitted infections (STIs) is another biological factor that makes women more vulnerable. Socio economic factors including women's lack of access to education or personal income perpetuate women's lower status. Moreover widespread poverty drives some women into commercial sex work. Cultural traditions such as forced marriage, female genital mutilation and older men's preference for younger women all risk factors prevalent in Nigeria contribute to increased female vulnerability to HIV (Pieniazek et al., 1991).

HIV pandemic is one of the most serious health crisis faced by the world today. Sub-Saharan Africa remains by far the worst affected region. In 2007, it contained an estimated 68% of people living with HIV and 76% of all Acquired Immunodeficiency Syndrome (AIDS) deaths (De Cock and Weiss, 2000). An estimated 33.4 million people were living with HIV/AIDS as at 2009 (UNAIDS, 2008). The HIV/AIDS epidemic has already devastated Nigeria, with nearly a million people dead and more than two million children orphaned. By 2003, the virus had infected approximately 5% of the adult population of about 100 million people (UNAIDS/WHO, 2005). In 2002, the National Intelligence Council identified the five countries expected to bear the heaviest burden of HIV infection in the expanding worldwide epidemic: India, China, Nigeria, Ethiopia, and Russia (Eberstadt, 2002). The

Fig. 1. Map of Nigeria showing the 36 states

council predicted that Nigeria and Ethiopia would be especially hard hit, with the number of people living with HIV/AIDS in Nigeria projected to balloon to ten to fifteen million by 2010, or as much as 26 percent of the adult population. Without effective prevention on a large scale, Nigeria will experience not only the tragedy of countless lives forever altered by the virus, but also untold adverse social and economic effects. In Nigeria the prevalence of HIV has increased from 1.8% in 1991 to 3.8% in 1993, 4.5% in 1999, 5.8%, 5.0% in 2003, 4.4% in 2005 to 4.6% in 2008 (Federal Ministry of Health Nigeria, 2009). Nigeria's population has grown rapidly in recent decades. In 1991 the total population was 88.9 million, and projections by the National Population Commission of Nigeria estimated that by 2003 the population would rise to 133 million (National Population Commission of Nigeria, 1991).The prevalence of HIV in Nigeria may not be as high as it is in most countries in Southern part of Africa. The prevalence is however significant considering the population of the country. There has been great concern in the international community as to whether Nigeria with her sub-optimal health infrastructure will be able to manage this pandemic.

Poverty is a major challenge associated with the increasing prevalence of HIV in Nigeria. With her annual income per capita below the average for other low-income countries, Nigeria is considered a "poor" nation. The country's health status indicators also are worse than average; Nigeria spends less than average on health. The United Nations Development

Programme has ranked Nigeria 152 out of 175 on the Human Development Index, a composite measure of income coupled with access to education and health services (United Nations Development Programme, 2004). By some estimates, two-thirds of Nigerians live on less than US$1 per day. Youth unemployment is a major problem, with estimates ranging between 40% and 60% (World Bank, 2004).Poverty—combined with economic vulnerability, institutional weaknesses, and socio-cultural complexity—exacerbates the difficulties inherent in tackling the Nigerian HIV epidemic and is responsible for the high HIV prevalence observed in selected groups; blood donors (commercial remunerated), unemployed, long distance truck drivers, abandoned babies, tuberculosis patient and unbooked antenatal women. The complexity of the HIV/AIDS epidemic stems from its links with all aspects of society and culture. Social and cultural factors affect not only viral transmission, but also the success of prevention strategies and the compassion with which people living with the virus are treated. A clear understanding of these factors therefore becomes a point of significance for planning the control of the epidemic. Heterosexual transmission accounts for as many as 95% of HIV infections in Nigeria, where having multiple sexual partners has been a major behavioural factor fuelling the epidemic. Non-sexual traditional practices—particularly male and female circumcision and the custom of creating facial and body markings with shared, non-sterile skin-piercing implements—expose significant numbers of people to infection as well. The aim of this chapter is to present the challenges associated with the management of HIV/AIDS pandemic in Nigeria.

2. HIV prevalence among Most At Risk Populations (MARPs)

2.1 HIV among blood donors and challenges of providing safe blood and blood products

Blood transfusions particularly in sub Saharan Africa currently face interesting challenges of accessing safe and adequate quantities of blood and blood products. The risk of transfusion –transmissible infections including HIV amongst others have provoked a greatly heightened emphasis on safety with inescapable implications on complexity and cost of providing a transfusion service (Tagny et al., 2008). Blood transfusion continues to be an important route of transmission of HIV particularly in developing countries among young children and pregnant women following transfusion for malaria associated anaemia and pregnancy-related complications (Foster and Buvé, 1995). A study undertaken to determine the seroprevalence of human immunodeficiency virus infection among 1,500 blood donors living in the Niger Delta area of Nigeria has shown a prevalence of 1.0%. The highest prevalence occurred among commercial remunerated donors (Ejele et al., 2005). Similarly a study of 33,682 and 1259 blood donors screened in two tertiary hospitals in Nigeria has indicated overall HIV seroprevalence rate of 7.66% (Fasola et al.,2008) and 0.71% (Salawu and Murainah, 2006) respectively. Studies to investigate the risk of transfusion transmissible HIV infection among Malian blood donors have indicated a prevalence of 2.6% (Diarra et al., 2009) and 4.5% (Tounkara et al., 2009). Undetectable HIV infections in blood banks pose a serious threat to public health (Zohoun et al, 2004). In Kenya, blood donations from high school students are preferred over adult samples due to lower HIV infection prevalence within this population. However a study carried out using stimmunology, an in vitro lymphocyte stimulation technique has unveiled a significant number of early, pre-seroconversion HIV carriers both among adult and teenage Kenyan populations (Mumo et al., 2009, Minga et al., 2010). A mathematical model constructed to quantify transfusion risks

across 45 sub-Saharan African countries using three components: the risk of a contaminated unit entering the blood supply, the risk that the unit will be given to a susceptible patient and the risk that receipt of the unit will lead to infection in the recipient. Variables included prevalence of infection in donors, extent of blood testing, test sensitivity, and susceptibility of recipients. Data from the World Health Organization (WHO) African Region and a systematic review of the literature were used to parameterize the model. Data suggest that the median overall risks of becoming infected with HIV from a blood transfusion in SSA were 1 infection per 1000 units (Jayaraman et al., 2010). A study to determine the prevalence of HIV among adolescent donors in Zimbabwe during the period between 2002 and 2003 has revealed that the prevalence of HIV in 2002 and 2003 were 0.48% and 0.38%, respectively. Prevalence was higher among first time and female donors (Mandisodza et al., *2006).* A study to estimate the prevalence of transfusion-transmissible HIV infection in two groups of blood donors at Douala city over the period of 1995 -2004 has indicated that the prevalence of HIV ranged from 2.2% to 8.12% at the Douala University and 7.89% at the blood bank of Laquintinie Hospital (Mogtomo et al.,2009). Remunerated and family replacement donors are at more risk of being HIV positive (Batina et al., 2007). Areas with high HIV-incidence rates compared to the developed world may benefit from additional testing in blood banks and may show more favourable cost-effectiveness ratios.

2.2 HIV infection and unemployment

Youth unemployment is a major problem in Nigeria, with estimates ranging between 40% and 60% (World Bank, 2004). Poverty—combined with economic vulnerability, institutional weaknesses, and socio-cultural complexity—exacerbates the difficulties inherent in tackling the Nigerian HIV epidemic. Human immunodeficiency virus (HIV) infection is highly endemic in Nigeria, particularly with the prevalence in 2001 at 5.8%. A previous study (Ejele at al., 2005) to determine the prevalence of HIV among 868 unemployed individuals in Port Harcourt comprising of 373 males and 495 females indicated a sero-prevalence rate of (3.19%). HIV seroprevalence was relatively higher among females (3.6%) compared to males (2.4%). The highest prevalence was found in the <19 years age group (5.1%) and lowest in the 40-49 years age group (2.3%), although the difference was not statistically significant (X^2 = 4.86, p = 0. 09). The highest prevalence occurred among separated subjects (7.7%) compared to singles (3.9%) and married subjects (1.8%).This study indicates a 3.1% prevalence of HIV infection among unemployed individuals studied and calls for urgent and concerted efforts aimed at promoting behavioural, cultural and social changes that will reverse the current trend in the prevalence of HIV among the unemployed.

2.3 HIV among abandoned babies in Nigeria

Paediatric HIV infection is fast assuming a serious dimension in developing countries. In addition, the early death of mothers creates a large number of orphans and vulnerable children, many of whom succumb to AIDS or complications of other infections and malnutrition. This trend is eroding gains of child survival efforts of previous decades. Disease progression in children who acquire HIV infection from their mothers is more rapid in Africa than in developed countries, probably because African children are exposed to early and multiple infections. Abandonment of newborn babies dates back to the bible days with the story of Moses. In Nigeria, it is a common observation to find babies abandoned in the hospital after birth, in gutters and hidden places possibly because the mother tested

positive for HIV. The act of child abandonment is greatly influenced by socio-economic constraints. In this era of the HIV Pandemic, many of the abandoned babies are feared to be babies of HIV sero positive mothers who for fear of stigmatisation, discrimination and the burden of caring for an HIV positive child, abandon their babies. HIV infection is endemic in Nigeria and is an important cause of infant mortality and morbidity. A previous study (Akani et al.,2006) was undertaken to determine the sero-epidemiology of HIV among One hundred and forty (n = 140) consecutively recruited abandoned babies with mean age of 11.5 ± 24.1 weeks made up to 79 males and 61 females. The babies were referred to the HIV screening unit from motherless baby's homes in Port Harcourt for pre-adoption HIV screening within a five years period (1999 – 2003). Babies were screened for HIV using the WHO approved immunocomb HIV I & II kits (Organics, Israel) – an enzyme linked immunosorbent assay for the quantitative and differential diagnosis of HIV in serum or plasma. Initially reactive samples were continued using Genscreen HIV 1 & 2 (p24) antigen test (Bro Rad, France). HIV was detected in 19(13.6%) of babies tested. Sero-prevalence was highest in babies 9 – 16 weeks (25.0%). Males accounted for the highest infection burden (57.9%) compared to (42.1%) for females. Data indicated that the prevalence of HIV declined from 12.5% in 1999 to 8.3% in 2000 and increased subsequently to 20% in 2001 but declined steadily to 16.1% in 2002 and 14.3% in 2003. HIV-1 accounted for the predominant viral subtype among babies sero-positive for HIV (89.5%). Chi square analysis indicates that symptom at abandonment was an independent risk factor for HIV infection among abandoned babies ($\chi^2 = 40.97$; $p = 0.0001$). This hospital-based study has confirmed a high prevalence of HIV among abandoned babies tested and highlights the importance of HIV screening for abandoned babies before transfer to foster parents and brings to bare the challenge associated with child adoption in Nigeria. Government, non-governmental organizations and Faith Based Organizations (FBO's) should embark on care and support programmes by providing young people with knowledge, information and youth-friendly health services in a bid to address the issue of child abandonment and HIV infection. The findings emphasize the need for capacity building of personnel working in motherless babies home to enable them cope with the challenges of the increasing incidence of child abandonment and HIV. There is the need to strengthen the family planning services for sero positive mothers who do not wish to have more babies. The issue of therapeutic termination of pregnancy in HIV-infected mothers in cases of unwanted pregnancies may need to be reconsidered.

2.4 HIV infection and the Nigerian military

Epidemiologic evidence indicates that throughout the world men and women in the military are among the most susceptible subpopulations to sexually transmitted infections (STIs), including HIV. In peacetime, STI rates in the military are two to five times higher than in comparable civilian populations; during wartime the rates tend to rise (UNAIDS, 1998). Conflict situations involving troops, vulnerable populations, and humanitarian workers further promote the transmission of HIV. In many African countries, the uniformed services report HIV prevalence rates higher than the national averages. In Uganda (27% versus 8.3%) (U.S. Bureau of the Census, Population Division, 1998) in South Africa (60% to 70%, compared with 20%) (Sarin, 2003), Cameroon (6.2% compared to 2%) (Adebajo et al., 2002), Sierra Leone (11% versus 5%) (Lovgren, 2001). Similarly in Malawi, 25% to 50% of army officials are already HIV positive (UNAIDS, 2005). Interestingly HIV/ AIDS is becoming the leading cause of death in the military and police forces in many settings in sub Saharan

Africa, accounting for as much as half of in-service mortality (Noah and Fidas, 2000). These findings have serious consequence on the territorial security. HIV/AIDS has the potential to wipe out the capability and experience of military forces when prevalence rates are high and prevention and mitigation efforts are ineffective or insufficient. In sub-Saharan Africa, the number of states at war or involved in significant lethal conflicts increased from 11 in 1989 to 22 in 2000 (Bakhireva et al., 2004, Nwokoji et al., 2004). In a survey conducted in Sierra Leone recently, Physicians for Human Rights estimated that 215,000 to 257,000 internally displaced women and girls experienced rape or other forms of sexual violence in war, as well as non-combat situations. This demonstrates the potential for women to be exposed to HIV during conflicts (Lovgren, 2001). Although Nigeria has not experienced a national war in the past 37 years, limited internal, inter-ethnic, and religious skirmishes have occurred in several regions. Moreover, women and children have become victims of forced sex and other human rights abuses. Several studies have shown that HIV prevalence among soldiers in Africa is elevated, with prevalence rates as high as 60% in the militaries of Angola and the Democratic Republic of Congo (Fleming,1988).Many African military forces have infection rates as high as five times those of civilian populations (Nwokoji et al., 2004, Bakhireva et al., 2004). It is important to remember that HIV transmission does not end when conflict ceases; when infected soldiers return to their communities, they continue to spread the virus. In Nigeria, this trend was confirmed by the increased HIV seroprevalence among soldiers returning home from a peacekeeping mission (Lovgren S, 2001). Peacekeeping operations by Nigerian soldiers in Liberia, Sierra Leone, Côte d'Ivoire, the former Yugoslavia, and Somalia at various times have produced other distinct strands of net transfer of infection from these countries to Nigeria. The lifestyle of peacekeeping officers is characterized by high levels of multiple sexual partners, low condom use, and exposure to blood transfusions in the line of duty. After an initial period of secrecy surrounding the extent of the HIV/AIDS problem in the military and among returning peacekeeping forces, the Nigerian military is addressing the spread of HIV among soldiers (Raufu, 2001).The coming out of soldiers living with HIV/AIDS has raised awareness of the impact of peacekeeping expeditions on the spread of HIV. It has also helped shape the public policy on HIV in Nigeria. The privileged position of the military means that policies made for it set standards to which the public HIV/AIDS policy can aspire, such as the introduction of a free antiretroviral program for infected soldiers (Raufu, 2002). Nigerian police officers also have been involved in peacekeeping operations, mostly within Nigeria but occasionally abroad. Their sexual lifestyles are no less risky than those of soldiers (Akinnawo et al., 1995). They maintain modest levels of condom use and high rates of STIs, take advantage of modern medical treatment, and report good rates of partner notification when infected but low rates of notifying their spouses about infection episodes. A previous study by Azuonwu et al (Azuonwu et al., 2011) investigated the prevalence of HIV among a total of One hundred and fifty military personnel aged between 20 and 55 years in the Niger Delta of Nigeria and observed an overall HIV prevalence rate of 14.67%. The HIV prevalence among the male was higher than that of the female group (84% versus 16%). There was a negative correlation between the CD4 count and HIV infection ($r = -0.443$, $p < 0.01$). The military community is considered a high-risk environment for HIV transmission. There are several compelling risk factors that increase the susceptibility of military personnel to HIV infection; danger and risk taking are integral parts of the military profession, military personnel tend to be young, single, and sexually active, they are highly mobile and stay away from their families and home communities for extended periods, they are often influenced by peer pressure rather than social convention, they are inclined to feel invincible and involve in

high risk sexual behaviour and they have more ready cash than other males where they are deployed and hence are surrounded by opportunities for casual and commercial sex.

2.5 HIV infection among long distance truck drivers

Truck drivers play an important role in HIV/AIDS transmission in many countries (Pandey et al., 2008, Sunmola, 2005). Previous report in Bangladesh and India found HIV prevalence of 15.9% and 17.8% respectively among long distance drivers (Gibney et al., 2003, Manjunath et al., 2002). Condom use among long distance drivers is low and /or inconsistent (Sugihantono et al., 2003). Long distance truck drivers are vulnerable to sexually transmitted diseases for several reasons; truckers are always on the move, have little or no access to sexual health services, migratory nature of their occupation often disconnect them from family and community, truck drivers rarely interact with orthodox medical practitioners and instead seek the help of quacks and home remedies to cure Sexually Transmitted infections (STIs) and many lack information about STIs and HIV/AIDS and their prevention. Previous report (Azuonwu et al., 2010) on a total of one hundred long-distance truck drivers in the Niger Delta of Nigerian aged between 21 and 60 years and mean age of 42.36 ±5.23 years that were screened for the presence of HIV antibodies indicated a prevalence of 10%. The prevalence of HIV was significantly higher in the 31-40 years. HIV 1 was the predominant viral subtype among the subjects (90%) while (10%) had HIV-2. None of the HIV-positive subjects had dual HIV 1 and 2 infections. The mean CD4 lymphocyte count for subjects positive for HIV was 380 ± 68.0 (range 312 – 448 cells/µl) while CD4 count for HIV negative subjects was 780 ± 76 cells/ µl (range 704 - 856 cells/µl. A significant negative correlation was observed between HIV positivity and CD4 count r-0.010 ($p = 0.01$). Authors recommended that intensive preventive measures be instituted coupled with the implementation of a vigorous enlightenment campaign targeting behavioural change from high risk culture among truckers. Efforts are urgently needed to provide access to sexual health education, treatment services and HIV testing facilities to reduce their vulnerability to HIV infection.

2.6 HIV infection among tuberculosis – infected Nigerians

Nigeria, with estimated 259,000 cases of tuberculosis, has the sixth largest population of people with tuberculosis (TB) in the world. The arrival of HIV/AIDS has caused a secondary tuberculosis epidemic in many African countries. Before the HIV epidemic, the incidence rate of new cases of tuberculosis had been estimated at 2 per 1,000. Tuberculosis (TB) and human immunodeficiency virus (HIV) have been closely linked since the emergence of acquired immunodeficiency syndrome (AIDS). HIV infection has contributed to a significant increase in the worldwide incidence of TB (Low and Eng, 2009). By producing a progressive decline in cell-mediated immunity, HIV alters the pathogenesis of TB, greatly increasing the risk of developing the disease in co-infected individuals, leading to more frequent extrapulmonary involvement and atypical radiographic manifestations. Although HIV-related TB is treatable and preventable, incidence rates continue to climb in developing nations where HIV infection and TB are endemic and resources are limited. Worldwide, TB is the most common opportunistic infection affecting HIV sero-positive individuals and it is the most common cause of death in patients with AIDS (API consensus expert committee, 2006). The prevalence of HIV infection among TB patients in several African countries ranges from 20% to 60%.1 The World Health Organization (WHO)

estimates that about 8 million new cases of TB and nearly 2 million deaths from the disease occur each year and approximately 10 million people are estimated to be co-infected with TB and HIV, and over 90% of these dually infected individuals reside in developing nations. In some areas of sub-Saharan Africa, the rates of co-infection exceed 1,000 per 100,000 populations (Yusuph, 2005). Worldwide, a similar change has occurred in some developed countries. The HIV epidemic has increased the global TB burden and focused attention on the need to strengthen links between TB and HIV/AIDS program. In response to these health emergencies, the WHO has developed an expanded strategy aimed at reducing the burden of HIV-related TB infection through close collaboration between TB and HIV/AIDS programmes. Infection with HIV is the most well known risk factor for the development of TB. Because of the prevalence of TB amongst HIV-infected patients the joint statement by the American Thoracic Society, Centres for Disease Control and Prevention, and Infectious Diseases Society of America recommends that all patients with TB undergo testing for HIV infection after counselling (Blumberg et al., 2003). A recent study (Erhabor et al., 2010) investigated the prevalence of HIV infection among 120 patients diagnosed with microbiologically proven TB. Subjects were Nigerians aged 18 to 54 years with a mean age of 39.5 years (standard deviation 6.75). Of the 120 TB patients tested (25%) were positive for HIV infection. HIV-1 was the predominant viral subtype. HIV prevalence was significantly higher in subjects in the 38-47 and 28-37 years age groups. The mean CD4 lymphocyte count of the HIV-infected TB subjects was significantly lower (195 ± 40.5 cells/μL) compared to the non-HIV infected (288 ± 35.25 cells/μL $p = 0.01$). This finding is in agreement with previous reports among 59 patients with pulmonary TB studied in Kampala, Uganda (De Cock et al., 1992) in which two-thirds of the patients were HIV sero-positive. Similarly in Sagamu, Nigeria Daniel and colleagues (Daniel et al., 2004) observed a 14.9% HIV prevalence amongst their cohort of TB infected patients. Of patients with confirmed pulmonary TB in Zambia, 49% were positive for HIV (Elliott et al., 1990). Studies among TB patients in Kenya (Barnes et al., 1991) observed 40.7% prevalence while nearly 40% of the smear-positive TB patients in Tanzania were attributable to HIV (Cantwell et al 1994). However, out of 13,269 patients diagnosed with TB in the Netherlands who were then tested for HIV between 1993 to 2001, 542 were HIV positive (4.1%) (Haar et al., 2006). Among 184 newly diagnosed TB patients tested for HIV in Singapore, 15 (8.2%) was seropositive (Eriki et al., 1991).

2.7 Challenges of mother – to child transmission of HIV among unbooked antenatal patriuents

Mother-to-child transmission (MTCT) of HIV represents an especially tragic dimension of the burden of HIV/AIDS, particularly in resource-constrained settings, where fragile and poorly funded health care systems hamper care and prevention efforts. The global HIV epidemic continues to expand, with an estimated five million people becoming infected each year. Over the decades, the epidemic, once dominated by infected males, has become progressively feminized. In sub-Saharan Africa, where about two-thirds of the global disease burden resides, 57% of adults living with HIV are women (UNAIDS, 2004). As more women contract the virus, the number of children infected from their mothers has been growing. Worldwide, an estimated 640,000 children acquired HIV in 2004 alone (UNAIDS, 2004), with more than 90% of the infections occurring through mother-to-child transmission. MTCT has become a critical children's health problem in Africa, contributing to severe morbidity and significant mortality and undermining the impact of programs that had significantly reduced child mortality in previous decades. Women can transmit HIV to their

babies in utero, during birth, and through breastfeeding. Without preventive interventions, approximately 25% to 40% of infants born to HIV-positive mothers will contract the virus. In the developed world with lower HIV prevalence rates, mother-to-child transmission has dropped to less than 2% with the implementation of universal Voluntary Counselling and Testing (VCT), ARV prophylaxis, elective caesarean section, and the avoidance of breastfeeding (Mofenson, 2003). Unfortunately, in Nigeria and other countries with poor health systems, particularly with poor maternal and child health programs, this transmission route continues to cause great concern. The key entry point to PMTCT programs is the VCT offered to pregnant women. The experiences of PMTCT programs in Nigeria and other African nations demonstrate that much of their success is determined by the proportion of women, who agree to be tested for HIV, return to obtain their test results, and accept the ARV prophylaxis, which is often a single dose of nevirapine. The infrastructure, capacity building, and training are required to maximize the "uptake" of VCT, as well as the development of clinically proven ARV prophylaxis protocols. ARV prophylaxis significantly reduces the rate of mother-to-child transmission of HIV. This consists of single or double ARVs during the last trimester of pregnancy or at delivery with a goal of lowering viral load to decrease the risk of transmission. Trials of various PMTCT protocols have been conducted in the developing world; yet viral drug resistance remains a problem (Mofenson et al., 1999). Although the current use of single dose nevirapine to HIV-infected pregnant women does significantly reduce mother-to-child transmission, it also leads to the development of nevirapine resistance in 12% to 40% of women (Eshleman et al., 2001). The development of drug resistance in either the mother or infant compromises ARV provision since nevirapine is often used in first-line regimens for adults and infants in developing country programs (Lallement, 2005). To date, the use of various short courses of ARVs given during the last trimester of pregnancy reduce levels of viral load and significantly lower the risk of in utero and intrapartum infection. HIV transmission through breast milk, however, continues to be a major obstacle for PMTCT efforts, particularly in Africa, where strong cultural and economic factors favour breast milk feeding rather than expensive breast milk substitutes. Furthermore, employment of safe breast milk substitutes is complicated by the fact that many HIV-infected women lack access to clean water and sanitation. Organized preventive screening programs for antenatal care were first introduced in Western Europe in the twentieth century with the hope that routine antenatal care would contribute to a reduction in maternal and infant mortality rates. Figures on maternal mortality in the developed world show that the risk of death as a result of pregnancy and child birth is approximately 1 in 7000 compared with 1 in 23 for women living in parts of Africa where antenatal care is poor or nonexistent (Carroli et al., 2001).

Most children living with HIV in Nigeria acquire the infection through mother-to-child transmission (MTCT), which can occur during pregnancy, labour, delivery, or breastfeeding. In the absence of any intervention, the risk of such transmission is 15%–30% in non-breastfeeding populations. Breastfeeding by an infected mother increases the risk by 5%–20% to a total of 20%–45% (de Cock et al., 2000). The risk of MTCT can be reduced to less than 2% by interventions that include antiretroviral prophylaxis given to women during pregnancy and labour and to the infant in the first weeks of life, during elective caesarean delivery (prior to the onset of labour and rupture of membranes), and avoidance of breastfeeding (European collaborative study, 2005). With these interventions, new HIV infections in children are becoming increasingly rare in many parts of the world, particularly in high-income countries. In many resource-constrained settings, elective

caesarean delivery is seldom feasible (Stanton and Holtz 2006), and it is often neither acceptable nor safe for mothers to refrain from breastfeeding. However, recent guidelines from the World Health Organization (World Health Organization, 2010) recommend that mothers known to be HIV-infected (and whose infants are HIV-uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first six months of life, introducing appropriate complementary foods after that. Breastfeeding should then be stopped only when a nutritionally adequate and safe diet without breast milk can be provided. In these settings, efforts to prevent HIV infection in infants initially focused on reducing MTCT around the time of labour and delivery. The unknown HIV status of these unbooked women presenting to clinic for the first time in the third trimester of pregnancy poses a risk not only to the patient and her baby, but also to the staff caring for them in the peripartum period. A recent study (Akani et al., 2010) was undertaken to determine the seroprevalence of HIV infection among unbooked pregnant women in the Niger Delta of Nigeria. One hundred and eighteen consecutively recruited unbooked subjects presenting to the isolation ward at the University of Port Harcourt Teaching Hospital were screened for HIV. Among the 118 subjects studied, 30 (25.4%) were positive for HIV. HIV-1 was the predominant viral strain. Gestational age of subjects at presentation was 28–40 weeks and mean age was 35.04 ± 8.06 years. The majority of subjects were primigravidas 66 (55.9%), while 52 (44.1%) were multigravidas. The prevalence of HIV was significantly higher among unbooked pregnant women with less formal education: 14 (11.9%) compared with 9 (7.6%), 5 (4.2%), and 2 (1.7%) for those with primary, secondary, and tertiary education, respectively (P = 0.01). Among the occupational groups, the prevalence of HIV was significantly higher among traders 14 (11.9%) than in career women 5 (4.2%, P = 0.04). Multigravid women were more susceptible to HIV infection 17 (14.4%) than primigravid women. Perinatal mortality and emergency caesarean section was high among unbooked pregnant women. These findings are very pertinent to health care delivery, because this pool of unbooked patients may not be benefiting from the Prevention of Maternal to Child Transmission program, thus increasing the paediatric HIV burden in our environment.

3. Challenges of HIV sero- discordance and HIV serostatus disclosure

The disclosure of HIV serostatus is a difficult emotional task creating opportunity for both support and rejection (Yashioka and Schustack, 2001). Barriers to disclosure include fear of accusation of infidelity, abandonment, discrimination and violence (Medley et al., 2004. Stigmatizing belief about AIDS and the associated fear of discrimination can influence decision to disclose ones HIV serostatus (Chesney and Smith, 1999). A considerable body of evidence has associated the act of disclosing personal trauma-related information with improved physiological health and that it can lead to support that facilitates initiation of and adherence to treatment (Chandra et al., 2003, Klitzman et al.,2004).The dilemma of choosing to disclose personal information is somewhat of a cruel paradox (Harber, 1992).Often people long to share a trauma or secret with another, yet they fear the possible rejection or alienation by the listener (Silver et al., 1990). A previous study (Akani et al., 2006) in the Niger Delta of Nigeria evaluated the rate, patterns and barriers to HIV serostatus disclosure. A pre-tested interviewer-administered questionnaire from 187 HIV infected people residing in a resource-limited setting in the Niger Delta of Nigeria was analysed. Of the 187 HIV seropositive patients studied, 144 (77.0%) had disclosed their HIV-serostatus while 43 (23.0%) had not. Results showed that the patients had disclosed their HIV-serostatus to:

parents (22.3%), siblings (9.7%), pastors (27.8%), friends (6.3%), family members (10.4%) and sexual partners (23.6%) (p = 0.004). Females were more likely (59.7%) to disclose their HIV serostatus compared with males (40.3%) (p = 0.003). Mothers were twice as likely (65.6%) to be confided in compared with fathers. Barriers to HIV serostatus disclosure included fear of stigmatization, victimization, fear of confidants spreading the news of their serostatus and fear of accusation of infidelity and abandonment (p = 0.002). Married respondents were more likely to disclose their status. Better-educated respondents with tertiary education were more likely to disclose their HIV-serostatus. Expectation of economic, spiritual, emotional and social support was the major reason for disclosure. The ratio of disclosure to non-disclosure among patients with non-formal education was (2.6:1.0), primary education (2.3:1.0), secondary education (3.3:1.0) and tertiary education (10.0:1.0). Disclosure of HIV serostatus can foster economic social and economic support. There is need for the re-intensification of interventional measure that combines provider, patients and community education particularly in the aspect of anti-stigma campaign, partner notification and skill building to facilitate appropriate HIV serostatus disclosure.

4. Reproductive health challenges associated with HIV – infection in Nigeria

Availability and use of antiretroviral drugs has changed the landscape of HIV/AIDS bringing about a change in the perception of HIV from an incurable deadly disease to a chronic manageable illness. As effective HIV treatments become more widespread, HIV-infected individuals are living longer and healthier lives. Many HIV-affected couples (sero-discordant and sero-concordant) are considering options for safer reproduction. A large body of evidence suggests that reproductive technologies can help HIV-affected couples to safely conceive with minimal risk of HIV transmission to their partner and baby. However, for most couples particularly in low income countries in sub Saharan Africa, such technologies are both neither geographically nor economically accessible (Matthews and Mukherjee, 2009). With HIV now considered to be a chronic manageable disease, attention is shifting to offering and improving quality of life particularly by the provision of reproductive health options/care to men and women living with HIV-1. Many HIV-infected men and women are now expressing their desire to father or mother a child. Assisted reproductive technologies, including intrauterine insemination (IUI), in vitro fertilisation (IVF) and intracytoplasmatic sperm injection (ICSI) in combination with semen washing have been used to decrease the risk of HIV -1 transmission in HIV-1-infected discordant couples with an HIV-1-infected man (van et al., *2009*) . Previous report indicates that in HIV-positive men taking HAART, seminal viral load is decreased but not eliminated and fertilization should be achieved through sperm washing to offer maximum protection for the uninfected female. Pregnant HIV-positive women on antiretroviral medication have a reduced risk of transmitting the virus, but should still be counselled about the possibility to further limit the chances of infecting their infant through elective Caesarean section (Semprini et al., 2004, Semprini et al., 2004b, Barreiro et al.,2007, Matthews et al., 2010) . HIV sero-discordant couples with strong desire for childbearing have a dilemma of risking HIV infection or infecting their spouse. Some risk transmission of HIV infection to reproduce. Over two-thirds of 104 couple wanting to procreate surveyed reported unprotected sex with their partner in the past 6 months. Most respondents, regardless of serostatus, said that viral load testing and awareness of post-exposure prevention had no effect on their condom use (van der Straten et al., 2000). A study to assess the reproductive health concerns among 195

persons living with HIV/AIDS in the Niger Delta of Nigeria Akani et al (in press) showed that 111 (56.9 %) indicated their desire to have children. Single subjects were more inclined to having children (66.6%) compared to married (53.4%) *p= .03*. Persons with no formal education are about twice as likely to have children (66.7%) compared to persons educated to tertiary education level (37, 0%) (*p=.01*). Knowledge about reproductive health options available to reduce risk of infecting their partners and or baby was poor. There is the need to support the sexual and reproductive rights of HIV-infected individuals, offer additional training to HIV counsellors on evidence-based best and affordable practices regarding reproductive health issues, develop policies that support the availability and accessibility to relevant reproductive and sexual health services.

5. Challenges of management of occupational exposure to HIV and availability of post exposure prophylaxis

HIV transmission in health care settings occurs when workers are stuck with needles or sharp instruments contaminated with HIV-infected blood or, less frequently, when workers are exposed to infected blood through an open cut or a mucous membrane, such as the eyes or nasal passages (Campbell, 2004). Patients in African settings may be more likely to be infected with HIV. This predisposes health care workers to HIV infection particularly in the absence of proper universal precautions. In developed countries, post-exposure prophylaxis is part of most health care policies. Post-exposure prophylaxis—a short course of triple-drug ART provided to prevent possible HIV infection has yet to be broadly institutionalized in Nigeria's health care facilities. It is hoped that with the increased availability of ARVs, this may be feasible in the near future. Sharp injuries and other exposure to patient's blood carry a risk of transmission of blood borne infections including HIV. Despite the long-standing recommendations in the developed world that Health Care Workers exposed to infected blood and blood product be offered post exposure prophylaxis, they remain unavailable to healthcare workers in most resource-limited settings in Sub-Saharan Africa. Also there is absence of established occupational health policy and policy for minimising the risk and management of percutaneous and mucosal exposure to high risk patient's blood and body fluids. A previous study (Erhabor et al, 2007) was carried out to demonstrate the epidemiology and risk of occupational exposure to HIV, HBV and HCV among health care workers (HCWs) and highlight areas where greater training is required. The study population included 13 health care workers; 5 males (38.5%) and 8 females (61.5%), mean age 34.15 +/- 6.8 years including 3 doctors (23.1%), 2 laboratory scientist (15.4%), 1 laboratory technician (7.7%), 6 medical students (46.2%) and 1 trainee laboratory assistant (7.7%). The care and follow-up provided to the health care workers in a 500 -bed tertiary health hospital in the Niger Delta of Nigeria who had percutaneous exposure to patient's blood between June 2002 and June 2005 were analyzed. All exposed health care workers were evaluated and offered follow up counselling. Five millilitres of blood from each of the HCWs and the source patients were screened by immmuno-enzymatic testing for HIV, HBV, and HCV. Exposures were concentrated in few areas of the hospital; paediatrics (46.2%); surgery (15.4%); obstetrics and gynaecology (7.7%) and laboratory unit (30.8%) (p = 0.05). Risk of exposure was significantly higher among females (61.5%) compared to males (38.5%) (p = 0.001). All exposed HCWs were seen and offered post exposure prophylaxis within 24 hours of exposure. All the exposed health care workers were sero-negative to HIV,

HBsAg and anti-HCV at exposure. The source patients were known in all cases. Evidence of HIV was present in 5 (38.5%); 1 (7.7%) had HBV while none had HCV infection. Of all the HCWs who completed the follow-up, only 1(7.7%) confirmed case of HBV sero-conversion occurred in a HCW who was not previously vaccinated against HBV but who received post exposure HBV vaccination. Exposure rate was significantly higher among house officers 7 (53.9%) followed by registrars 3 (23.1%) and laboratory scientist 3 (23.1) ($p = 0.01$). There is need to urgently address the issue of occupational exposure in Nigeria by the formulation of occupational health policy in Nigeria as well as provision of training on universal precaution, phlebotomy, modifying procedures that have high risk, developing institutional policy for handling of sharps and post-exposure management of healthcare workers as well as the provision of protective post exposure prophylaxis for all exposed HCWs.

6. Challenges of availability of affordable laboratory-monitoring tests and trained manpower required for the implementation of HIV therapy

Few laboratories in resource-constrained countries can afford to perform laboratory-monitoring tests required for the implementation of HIV therapy. Flow cytometric techniques are expensive and require a significant infrastructure to perform. In addition, the measurement of quantities of virus in the blood—known as viral load—is an important clinical parameter to evaluate the severity of disease and to monitor the efficacy of therapy. These expensive laboratory tests require complex technologies not previously used in much of the developing world. Scientists are devising new methodologies that they hope will be as sensitive as existing methodologies yet more cost effective. The laboratory infrastructure is the most expensive and specialized part of any institutional framework for HIV/AIDS cares (Stephenson, 2002). In Nigeria, policymakers and decision makers have tended to view laboratories in the narrow context of HIV screening. At the onset of the ART program no laboratory in the country had the full capacity needed to monitor treatment response and toxicity properly. Only a handful of institutions had the capacity to perform CD4+ counts, a necessary test for decision-making in HIV therapy. The federal government program provided the training and technical capacity for CD4+ tests to be performed in the 25 treatment centres using a manual microscopic technique. This technology is labour intensive, and one laboratory scientist cannot reliably perform more than 10 tests a day. This pace cannot accommodate the expansion of ART in these centres and in other centres that would rely on them for laboratory support. Through a generous donation from MTN Nigeria, a telecommunications company, APIN was able to equip two federal treatment centres—at University College Hospital and Jos University Teaching Hospital—with flow-cytometry–based instruments (Imade et al., 2005), which allow technicians to process more than 100 CD4+ tests daily. The instruments cut the cost of the tests four- to fivefold. All Harvard PEPFAR program sites are now equipped with these instruments. Many other programs in Nigeria, particularly the other PEPFAR programs, have opted for that investment as well. Similarly, when the ART program started in Nigeria, only one centre had the capacity to perform viral load tests routinely; these tests are used to measure the virus level in the blood of infected individuals and thereby allow clinicians to assess treatment efficacy. This centre, the Nigerian Institute of Medical Research, had been upgraded and equipped by a grant from the Ford Foundation. APIN, a project based at the Harvard School of Public Health (HSPH) and sponsored by the Bill & Melinda Gates

Foundation, has significantly affected the level of infrastructures available in its four target states of Borno, Lagos, Oyo, and Plateau. All APIN sites now routinely perform HIV viral load tests with technical assistance and/or equipment provided by HSPH. When HSPH became a PEPFAR implementation partner, it further expanded the capacity of its collaborating centres. HSPH has provided training and retraining of health professional and laboratory personnel and helped upgrade or establish six laboratories for HIV and STI services. In addition few sites have facilities to perform infant diagnostics using polymerase chain reaction (PCR), the only technique capable of diagnosing HIV infection in infants. In addition, most sites have been involved in projects in collaboration with HSPH to conduct surveillance studies of the HIV strains circulating in Nigeria and of the drug resistance levels in various patient populations. In a previous study in the Niger Delta of Nigeria (Erhabor et al., 2006) investigated the relevance of absolute lymphocyte count as a surrogate marker for CD4 lymphocyte count as a criterion for initiating HAART in HIV-infected Nigerians. A total of 100 consecutive recruited HIV-infected, previously antiretroviral naive persons and 30 HIV-negative individuals blood samples were run for absolute lymphocyte and CD4 lymphocyte counts and results were compared by a model of linear regression analysis. An overall modest correlation was observed between absolute lymphocyte count and CD4 lymphocyte (r = 0.51) and at CD4 lymphocyte threshold relevant for clinical management of HIV-infected; <200, 200-350 and >350 cells/microL (r = 0.41, 0.30 and 0.21) respectively. Mean absolute lymphocyte count of 1.60 +/- 0.77 x 10(9)/L, 1.88 +/- 1.11 x 10(9)/L and 2.04 +/- 0.54 x 10(9)/L was equivalent respectively to CD4 of <200, 200-350 and >350 cells/microL. This study indicated a modest correlation between absolute and CD4 lymphocyte counts of HIV-infected Nigerians and at CD4 lymphocyte count threshold significant for clinical management of HIV-infected. Absolute lymphocyte count can become a minimal inexpensive alternative to CD4 lymphocyte count in conjunction with WHO staging and clinical status of patient in determining the optimal time to initiate therapy particularly in resource limited settings where other expensive methods of CD4 enumeration are unavailable. The infrastructure for the diagnosis of HIV and monitoring of patients on antiretroviral therapy in Nigerians is still sub-optimal and the capacity to monitor patients on ARV therapy is inadequate. These diagnostic limitations have hindered the effective monitoring of patients on antiretroviral therapy. There is need to improve the facilities for HIV diagnosis and treatment monitoring as well as manpower development of biomedical scientist to effectively carry out these specialized diagnostic services.

7. Challenges of deciding the optimal time to start antiretroviral treatment

Highly active antiretroviral therapy (HAART) has changed the landscape of HIV- related care in the developed world with marked reduction in mortality and morbidity (Cameron et al., 1998). This possibility however is beyond the reach of a vast majority of HIV-infected in sub Saharan Africa. Following the development of HAART, many physicians were quite aggressive in treating patients at virtually any stage of this human retroviral disease. Increasing concern related to drug toxicities, pill burden, cost and ability of patients to adhere to strict and complicated regimens, have complicated the decision-making process for physicians and patients alike (Volberding, 2000). Despite promised price-reduction and increased availability of generic drugs in some countries, cost remains a major factor in deciding when to start therapy. Early intervention suggested that a higher proportion of

patients achieved a viral load of < 500 cells/µl if started on HAART at a CD4+ count of >500 cells/µl and >350 cells/µl rather than at < 200 cells/µl (Meibohm et al., 2000, Moore et al., 2000). Long-term clinical outcomes data however are not available to fully endorse this approach. The British HIV association recommends that therapy be initiated once CD4+ cell count falls to 350 cells/µl (British HIV Association (BHIVA), 2000). The argument for a conservative approach in the initiation of HAART is that most regimen are difficult to tolerate, non- adherence leads to the development of resistance, thus limiting future treatment options (Molla et al., 1996, d' Arminio Monforte et al., 2000) and that considerable reconstitution of the immune system seems possible even in patients initiating HAART at a low CD4+ cell count (Miller et al., 1999). Increasing concerns related to cost, drug toxicity, pill burden, tolerability ability of patient to adhere to strict and complicated regimen and emergence of drug resistance has complicated the decision making process of the optimal time to initiate antiretroviral therapy in Nigeria. A previous study (Ejele et al.,2004) aimed at determining if there is any immunological advantage in initiating HAART at a pre-therapeutic CD4 count of > 350cells/µl rather than at 200-350 or < 200 cells/µl investigated one hundred HIV-infected previously antiretroviral- naive individuals grouped under 3 $CD4^+$ lymphocyte count thresholds; < 200, 200 – 350 and > 350 cells/µl who were randomized to take HAART of stavudine (40mg) lamivudine (150mg) and nevirapine (200mg) orally twice daily. CD4 lymphocyte count was determined serially every 8 weeks for an observation period of 48 weeks. CD4 lymphocyte count responses were compared statistically based on pre-therapeutic CD4 lymphocyte counts. The overall increase in CD4 lymphocyte count irrespective of baseline CD4 count was 122 cells/µl ($p < 0.01$). CD4 lymphocyte count response to 48 weeks HAART was significantly higher in patients initiating HAART at a pre-therapeutic CD4 count of <200 cells/µl (163 cells/µl) compared to 118 and 50 cells/µl respectively for those initiating at 200 – 350 and > 350 cells/µl respectively. HIV-related morbidity of 3% was found among subjects who initiated HAART with a pre-therapeutic CD4 count of < 200 cells/µl. Steven -Johnson syndrome was the commonest adverse clinical event observed occurring in 15% of subjects. This study indicates that there is no long-term advantage in terms of CD4+ lymphocyte response in initiating HAART at a pre-therapeutic CD4 count of > 350 cells/µl rather than at 200 – 350 cells/µl. This present study appears to support postponing the initiation of therapy in some patients until the CD4+ count approaches 200 cells/µl particularly in sub-Saharan Africa where drug accessibility and affordability constitutes a major challenge.

8. Challenges of adherence, compliance, drug resistance and universal access to antiretroviral treatment

With the widespread use of antiretrovirals particularly in the developed world, there has been a transformed perception of HIV/AIDS from a fatal incurable disease to a manageable chronic illness (Palella et al., 1998) .However access to ART remains limited, especially in developing countries where paradoxically a significant number of HIV-infected live but with only an insignificant 28% of the 7.1 million in need of treatment having access (WHO/UNAIDS/UNICEF 2007). Antiretroviral treatment (ARV) was introduced in Nigeria in the early 1990s; they were only available to those who paid for them. As the cost of the drugs was very high at this time and the overwhelming majority of Nigerians were living on less than $2 a day, only the wealthy minority were able to afford the treatment. In 2002 the

Nigerian government started an ambitious antiretroviral treatment programme, which aimed to supply 10,000 adults and 5,000 children with antiretroviral drugs within one year. An initial $3.5 million worth of ARVs were to be imported from India and delivered at a subsidized monthly cost of $7 per person (Odutolu et al., 2006). The programme was announced as Africa's largest antiretroviral treatment programme. By 2004 the programme had suffered a major setback as too many patients were being recruited without a big enough supply of drugs to hand out. This resulted in an expanding waiting list and not enough drugs to supply the high demand. The patients who had already started the treatment then had to wait for up to three months for more drugs, which can not only reverse the progress the drugs have already made, but can also increase the risk of HIV becoming resistant to the ARVs. Eventually, another $3.8 million worth of drugs were ordered and the programme resumed. Resources needed to provide sufficient treatment and care for those living with HIV in Nigeria are seriously lacking. A study of health care providers found many had not received sufficient training on HIV prevention and treatment and many of the health facilities had a shortage of medications, equipment and materials (Physicians for Human Rights, 2006). The government's National HIV/AIDS Strategic Framework for 2005 to 2009 set out to provide ARVs to 80 percent of adults and children with advanced HIV infection and to 80 percent of HIV-positive pregnant women, all by 2010 (WHO, UNAIDS, UNICEF,2007). However, only 31 percent of people who needed treatment for advanced HIV infection received it in 2009. According to the latest WHO guidelines (2010), which advise starting treatment earlier, HIV treatment coverage is only 21% (WHO, UNAIDS, UNICEF, 2010). As a result of this slow progress the treatment goals were set back to 2015 in the revised framework (2010 to 2015) (NACA, 2009). It has been estimated that the Nigerian government are contributing an insignificant 5 percent of the funds for the antiretroviral treatment programmes (HERFON, 2007). The majority of the funding comes from development partners. The main donors are PEPFAR (the President's Emergency Plan for AIDS Relief), the Global Fund and the World Bank. In 2002, the World Bank loaned US$90.3 million to Nigeria to support the 5-year HIV/AIDS Programme Development Project (HERFON, 2007). In May 2007 it was announced that the World Bank were to allocate a further US$50 million loan for the programme (World Bank, 2008). In 2008 PEPFAR provided approximately US$448 million to Nigeria for HIV/AIDS prevention, treatment and care, (PEPFAR, 2008) the third highest amount out of PEPFAR's 15 focus countries. In the same vein, the Global Fund in 2008 disbursed US$95 million in funds for Nigeria to expand treatment, prevention, and prevention of mother-to-child transmission programmes (Global fund 2009). Even the availability of financial resources has not brought the number of patients on ART to the level desired particularly in some settings in Africa.

For example the Global fund has put forward US$1.9 billion in order to scale-up access to ART (UNAIDS 2006). In some settings in Africa, the cost of antiretrovirals does not seem to be the most important constraint of access to ART, as many of the drugs are supplied free of cost to eligible patients through combined efforts by countries and bilateral and multilateral partners. Mozambique, a country with one of the highest HIV/AIDS burden, only 14% of those in need received ART by the end of 2006 (WHO/UNAIDS/UNICEF 2007). Mozambique spent less than 30% of the donor funds earmarked for the health ministry (Nemes et al., 2006).This poor absorptive capacity of the public institutions in

most countries in Africa shows that there are other factors; health- systems level barriers (insufficient human resources and judicious use of donor funds) and population –level barriers (lack of information about ART, stigmatization and discrimination) may prevent or restrict access to ART.

Antiretroviral treatment causes improvement in the immunologic status and reduction in the viral load (Erb et al., 2000) thus reducing the incidence of hospitalization and mortality (Paterson et al., 2000) .Treatment effectiveness however requires a high level of adherence to medication regimens (Vanhove et al., 1996).Missing of even a few doses of antiretroviral medication can lead to drug resistant strains of HIV (Bangsberg et al., 2000).A previous study (Erhabor et al., 2009) to investigate the short-term effect of highly active antiretroviral therapy on the CD4 lymphocyte count of HIV-infected Nigerians at the Haematology Department of the University of Port Harcourt Teaching Hospital involving 70 HIV-infected subjects placed on highly active antiretroviral therapy and thirty HIV-infected yet to start therapy due to unaffordability were monitored as controls. CD4 lymphocyte count was determined at baseline for subjects and controls. Subjects were placed on HAART for 12 weeks while controls that were yet to start therapy were monitored as controls. CD4 lymphocyte count was repeated after 12 weeks and the differences compared statistically. We observed that subjects and control patients did not differ significantly in their CD4 lymphocyte count at baseline ($p > 0.05$), but after 12 weeks HAART in subjects, there was a mean increase in CD4 count of (39 cells/µl) in subjects, while untreated controls showed a mean decline of (12 cells/µl) $p < 0.05$. There was a statistically significant variation in the therapy dependent increases in CD4 count of HAART treated subjects based on pre-therapeutic baseline CD4 count ($\chi^2 = 180.39$, $p < 0.05$). The HAART dependent increase in CD4 counts was higher in younger subjects 19-28 years (31 cells/µl) compared to older subjects 49-58 years (21 cells/µl) ($p = 0.01$). Similarly CD4 response was found higher in females compared to males ($p = 0.01$). Low adherence has been associated with detectable viral load (>500 viral RNA copies/ml of plasma (Ruthbun et al., 2005) and possible cross resistance to other antiretrovirals of the same class (Tchetgen et al., 2001). A previous study (Nwauche et al., 2006) to evaluate the factors militating against adherence to antiretroviral therapy among 187 HIV-infected persons on a combination therapy of two-nucleoside analogue; stavudine and lamivudine and one non-nucleoside nevirapine in the Niger Delta of Nigeria indicated an adherence rate of 49.2%.Factors associated with non-adherence included; cost of antiretrovirals, educational status of subjects, medication adverse effects, occupational factors and high pill burden of prescribed regimen. There is need for universal access to antiretroviral treatment .Cost constraint remains a major limiting factor on adherence particularly in resource-limited settings (Muko et al., 2004). National government particularly those in sub Saharan Africa have prolonged reluctance to provide the best possible treatment citing numerous concerns ranging from cost to the ability of patients to adhere to complex life-long treatment. However South Africa a country with more than 5 million citizens living with HIV has proved the pundits wrong. The prices of antiretrovirals having precipitously plummeted by more than 95% as a result of the South African government developing the political will to take on board the challenge of universal access. This strategic and humanitarian obligation has resulted in an increase in adherence to a high level of more than 90%.The world health organization must remain resolute on the initiative of universal access to antiretroviral treatment particularly in developing countries where paradoxically the greatest HIV disease burden exist but with an insignificant number having

access. There is an urgent need for universal access and sustainability of antiretroviral therapy particularly in resource-limited settings. There is need for supervised medication delivery. Efforts should be made towards simplifying the therapeutic regimen to reduce the bill burden and substitution with treatment combination and strategies that minimise negative adverse effects, coupled with the re-intensification of patient education and counselling.

9. Conclusion

Nigeria is the most populous nation in Africa Nigeria is the most populous nation in Africa and is home is home to more than 130 million people. These individuals belong to more than 350 ethnic and linguistic groups, and their country is ranked among the 25 poorest in the world. As many as six million people are already infected with the virus. HIV prevalence rates in some states are as high as 12 percent. At least two million children have been orphaned by AIDS. Health facilities in Nigeria are suboptimal. Nigeria faces many daunting challenges in dealing with its HIV/AIDS epidemic.

Public education must play a key role in the success of prevention programs and increase in the uptake of HIV testing. Behavioural change programs must encourage individuals to reduce their risk of HIV acquisition. The stigmatization and discrimination that have typified societal responses must be dealt with promptly, as they compromise the effectiveness of prevention programs. The early involvement and support of the government in the HIV/AIDS campaign can set the necessary groundwork for a continuing strong leadership that will be critical for initiating and sustaining an effective nationwide prevention program. Stigmatization and discrimination against PLWHAs are common in Nigeria. Often both Christian and Muslim religious leaders view immoral behaviour as the cause of the HIV/AIDS epidemic. PLWHAs often lose their jobs or are denied health care services because of the ignorance and fear surrounding the disease. There is need for increased national campaigns and more visible and vocal societies and support groups for people infected with or affected by HIV as well as education of the public about HIV/AIDS in a bid to dispelling myths and giving the disease a human face.

New methods to detect antibodies to HIV are needed for diagnosis, and although the simple rapid test and the enzyme-linked immunosorbent assay formats have been improved, they remain expensive for Nigerian patients. Furthermore, voluntary counselling and testing (VCT) programs are still based in urban centres, where they remain inaccessible to many Nigerians. Clinical management of HIV infection requires the regular measurement of CD4+ lymphocytes in the blood. Flow cytometric techniques are expensive and require a significant infrastructure to perform. In addition, the measurement of quantities of virus in the blood—known as viral load—is an important clinical parameter to evaluate the severity of disease and to monitor the efficacy of therapy. These expensive laboratory tests require complex technologies not previously used in much of the developing world. Scientists are devising new methodologies that they hope will be as sensitive as existing methodologies yet more cost effective. To accommodate these new and critical diagnostic clinical tools, Nigerian institutions will need ongoing training, capacity building, and infrastructure development. These requisites will grow even more acute as the country scales up its ART program.

Healthcare workers are at risk of acquiring HIV infection occupationally through percutaneous or mucosal exposure to contaminated blood and body fluids. There is need to

urgently address the issue of formulation of occupational health policy in Nigeria as well as provision of training on universal precaution, phlebotomy, modifying procedures that have high risk, developing institutional policy for handling of sharps and post-exposure management of healthcare workers, provision of HIV post-exposure prophylaxis for exposed healthcare workers.

Blood transfusion continues to be an important route of transmission of HIV particularly in Nigeria among young children and pregnant women following transfusion for malaria associated anaemia and pregnancy-related complications. Nigeria faces several enduring challenges; chronic blood shortages, high prevalence of transfusion-transmissible infections, absence of functional national blood transfusion service, recruitment and retention of voluntary non –remunerated donors. Blood safety remains an issue of major concern in transfusion practice in Nigeria where national blood transfusion services and policies, appropriate infrastructure, trained personnel and financial resources are inadequate to support the running of a voluntary non-remunerated donor transfusion service. This is further aggravated by the predominance of family replacement and commercially remunerated blood donors, rather than regular benevolent, non-remunerated donors who give blood as a result of altruism. We advocate that commercial remunerated donation of blood be discouraged. There is need for unlimited supply of highly sensitive HIV test kits for the testing of donors. Political will and open-mindedness to innovative ways to improve supply and safety of blood are essential to promote more evidence-based approaches to blood transfusion practice in Nigeria.

The development and widespread use of antiretrovirals in the developed world has brought about a transformed perception of HIV/AIDS from a fatal incurable disease to a chronic manageable illness. There is an urgent need for universal access and sustainability of antiretroviral therapy particularly in Nigeria. There is need for supervised medication delivery. Efforts should be made towards simplifying the therapeutic regimens to reduce the pill burden and substitution with treatment combination and strategies that minimize negative adverse effects coupled with the re-intensification of patient's education and counselling.

There is concern in the developed world about the ability of Nigeria to effectively manage her HIV epidemic particularly in the midst of her sub-optimal health infrastructure including widespread poverty and a large and sexually active youthful population. The most effective interventions has to be multi-sectoral, with a high-level government commitment to tackle the problem, policy changes resulting from an awareness of the impact of HIV/AIDS on society, and the development of communications and media efforts, health interventions targeting high-risk populations, laboratory and field research, and scientific training. Without effective multi-sectoral intervention on a large scale, Nigeria is likely to experience not only the tragedy of countless lives forever altered by the virus, but also untold adverse social and economic effects.

10. References

[1] Adebajo SB, Mafeni J, Moreland S, et al (2002). Knowledge, Attitudes and Sexual Behaviour among Nigerian Military Concerning HIV/AIDS and STD*: Final Technical Report.* Abuja, Nigeria: Policy Project.

[2] Akani CI, Erhabor O (2006). Sero-epidemiology of HIV infection among abandoned babies in Port Harcourt, Nigeria. *Annals of African Medicine, Vol. 5(1): 6 – 9.*

[3] Akani CI, Erhabor O, Allagoa DO (2010). Human immunodeficiency virus prevalence in an unbooked obstetric population in the Niger Delta. *HIV/AIDS - Research and Palliative Care, 2:179–184.*

[4] Akinnawo EO (1995). Sexual networking, STDs, and HIV/ AIDS transmission among Nigerian police officers. *Health Transit Rev, (Suppl 5):S113–S121.*

[5] API consensus expert committee. API TB Consensus guidelines (2006). Management of pulmonary TB, extra-pulmonary TB and TB in special situations. *J Assoc Physicians India,* 54:219–234.

[6] Azuonwu O, Erhabor O, Frank-Peterside N (2010).HIV Infection in Long-Distance Truck Drivers in a Low Income Setting in the Niger Delta of Nigeria. *J Community Health.*, 36(4):583-587.

[7] Azuonwu O, Erhabor O, Obire O. HIV Seroprevalence among military personnel in the Niger Delta of Nigeria. J Community Health.2011 May 17.[Epud ahead of print].PMID:21584818.

[8] Bangsberg DR, Hetcht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L, Bamberger JD, Chesney MN, Moss A (2000).Adherence to protease inhibitor and development of drug resistance in an indigent population.*AIDS,14:357-366*.

[9] Bakhireva LN, Abebe Y, Brodine SK, et al (2004). Human immunodeficiency virus/acquired immunodeficiency syndrome knowledge and risk factors in Ethiopian military personnel. *Mil Med, 169(3): 221–226.*

[10] Bangsberg DR, Hetcht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L, Bamberger JD, Chesney MN, Moss A (2000).Adherence to protease inhibitor and development of drug resistance in an indigent population.*AIDS,14:357-366*.

[11] Barnes PF, Bloch AB, Davidson PT, Snider DE Jr (1991). TB in patients with human immunodeficiency virus infection. *N Engl J Med,* 324(23):1644–1650.

[12] Barreiro P, Castilla JA, Labarga P, Soriano V (2007). Is natural conception a valid option for HIV-serodiscordant couples? *Human Reproduction, 22(9): 2353-2358.*

[13] Batina A, Kabemba S, Malengela R (2007). Infectious markers among blood donors in Democratic Republic of Congo (DRC). *Rev Med Brux*, *28(3):145-149.*

[14] Blumberg HM, Burman WJ, Chaisson RE, et al (2003). American Thoracic Society/Centres for Disease Control and Prevention/Infectious Diseases Society of America: treatment of TB. *Am J Respir Crit Care Med,* 167:603–662.

[15] Brenan CA, Bodelle P, Coffey R, et al (2008). The prevalence of diverse HIV-1 strains was stable in Cameroonian blood donors from 1996 to 2004. *J Acquir Immune Defic Syndr,*49(4):432–439.

[16] British HIV Association (BHIVA) (2000). Guidelines for the treatment of HIV-infected adults with antiretroviral therapy. *HIV Med, 1: 76 – 101.*

[17] Cameron DW, Heath- Chiozzi M, Danner S, et al (1998). Prolongation of life and prevention of AIDS complications in a randomized controlled clinical trial of ritonavir in patients with advanced HIV disease. *Lancet, 351: 543 – 549.*

[18] Cantwell MF, Snider DE Jr, Cauthen GM, Onorato IM (1994). Epidemiology of TB in the United States, 1985 through 1992. *JAMA,* 272(7):535–539.

[19] Carroli G, Rooney C, Villar J (2001). How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatr Perinat Epidemiol,* 15(1):1–42.

[20] Chandra PS, Deepthivarma S, Manjula V (2003). Disclosure of HIV infection in South India: patterns, reasons and reactions. *AIDS Care, 15:207-215.*

[21] d' Arminio Monforte A, Lepri AC, Rezza G, et al (2000). Insight into reason for discontinuation of the first HAART regimen in a cohort of antiretroviral naïve patients. *AIDS, 14: 499 – 507.*

[22] Daniel OJ, Salako AA, Oluwole FA, Alausa OK, Oladapo OT (2004). Human immunodeficiency virus sero-prevalence among newly diagnosed adult pulmonary TB patients in sagamu, Nigeria. *Nigeria Journal of Medicine,* 3(4):393–397.

[23] de Cock KM, Fowler MG, Mercier E, et al (2000). Prevention of mother- to- child HIV transmission in resource-poor countries: Translating research into policy and practice. *JAMA,* 283(9):1175–1182.

[24] De Cock KM, Soro B, Coulibaly IM, Lucas SB (1992). TB and HIV infection in sub-Saharan Africa. *JAMA,* 268:1581–1587.

[25] De Cock KM and Weiss HA. The global epidemiology of HIV/AIDS (2000). *Tropical Medicine International Health,* 5: 3-9.

[26] Diarra A, Kouriba B, Baby M, Murphy E, Lefrere JJ (2009). HIV, HCV, HBV and syphilis rate of positive donations among blood donations in Mali: lower rates among volunteer blood donors. *Transfus Clin Biol*, *16(5-6):444-447.*

[27] Eberstadt N (2002). The future of AIDS. *Foreign Aff,* 81(6); 22-45.

[28] Ejele OA, Nwauche AC, Erhabor O (2004). Highly active antiretroviral therapy (HAART) in HIV-infected Africans: The question of the optimal time to start. *Proceedings of the World AIDS conference, Bangkok, 203 – 208.*

[29] Ejele OA, Nwauche CA, Erhabor O (2005). Seroprevalence of HIV among unemployed individuals undergoing pre-employment medical examination in Port Harcourt. *Niger J Med, 14(4):419-421.*

[30] Ejele OA, Nwauche CA, Erhabor O (2005). Seroprevalence of HIV infection among blood donors in Port Harcourt, Nigeria. *Niger J Med; 14(3):287-289.*

[31] Elliott AM, Lout N, Tembo G, et al (1990). Impact of Human immunodeficiency virus on TB patients in Zambia, a cross-sectional study. *BMJ,* 301(6749):412–415.

[32] Erb P, Battegay M, Zimmerli W, Rickenbach M, Egger M (2000). Effect of antiretroviral therapy on viral load, CD4 cell count and progression of acquired immunodeficiency syndrome in a community of human immunodeficiency virus-infected cohort study. *Arch Intern Med, 160: 1134-1140.*

[33] Energy Information Administration (2007).Official energy statistics from the U.S government. Nigerian energy profile.

[34] Erhabor O, Akani CI, Eyindah CE. Reproductive Health Options among HIV-Infected Persons in a Low Income Setting in the Niger Delta of Nigeria. In press

[35] Erhabor O, Uko EK, Adias T (2006). Absolute lymphocyte count as a marker for CD4 T-lymphocyte count: criterion for initiating antiretroviral therapy in HIV infected Nigerians. Niger J Med,15(1):56-59.

[36] Erhabor O, Ejele OA, Nwauche CA (2007). Epidemiology and management of occupational exposure to blood borne viral infections in a resource poor setting: the case for availability of post exposure prophylaxis. *Niger J Clin Pract, 10(2):100-104.*

[37] Erhabor O, Jeremiah ZA, Adias TC, Okere CE (2010). The prevalence of human immunodeficiency virus infection among TB patients in Port Harcourt Nigeria. *HIV/AIDS - Research and Palliative Care: 2 1–5.*

[38] Eriki PP, Okwere A, Aisu T (1991). The Influence of human immunodeficiency virus infection of TB in Kampala, Uganda. *Annual Review of Respiratory Diseases*. , 40:128–132.

[39] Erulkar AS, Bello M (2007).The experience of married adolescent girls in northern Nigeria. The Population Council,1-19.

[40] Eshleman SH, Mracna M, Guay L, et al (2001). Selection and fading of resistance mutations in women and infants receiving nevirapine to prevent HIV-1 vertical transmission (HIVNET 012). AIDS. 2001 Oct 19; 15(15):1951-1957.

[41] European collaborative study (2005). Mother-to-child transmission of HIV infection in the era of highly active antiretroviral therapy. *Clin Infect Dis,* 40(3):458–457.

[42] Fasola FA, Kotila TR, Akinyemi JO (2008). Trends in transfusion-transmitted viral infections from 2001 to 2006 in Ibadan, Nigeria. *Intervirology; 51(6):427-431).*

[43] Federal Ministry of Health, Nigeria (2009).National Blood Transfusion Service- About us.

[44] Federal Ministry of Health, Nigeria (2009). Report of the 2008 National HIV seroprevalence sentinel survey among pregnant women attending antenatal clinic in Nigeria: 1-46.

[45] Fleming AF (1988). Sero epidemiology of human immunodeficiency viruses in Africa. *Biomed Pharmacother,* 42(5):309–320.

[46] Foster S, Buvé A (1995). Benefits of HIV screening of blood transfusions in Zambia. *Lancet*, *22; 346(8969):225-227.*

[47] Gibney L, Saquib N, Matzger J (2003). Behavioural risk factors for STD/HIV transmission in Bangladesh trucking industry. *Social Science and Medicine, 56:1411-1424.*

[48] Harber KD, Pennebaker J (1992). Overcoming traumatic memories. In: Christianson SA, ed. The handbook of emotion and memory. Hillsdale (NJ): Erlbanin, 359-387.

[49] Imade GE, Badung B, Pam S, et al (2005). Comparison of a new, affordable flow cytometric method and the manual magnetic bead technique for CD4 T-lymphocyte counting in a northern Nigerian setting. *Clin Diagn Lab Immunol,* 12(1):224–227.

[50] Jayaraman S, Chalabi Z, Perel P, Guerriero C, Roberts I (2010). The risk of transfusion-transmitted infections in sub-Saharan Africa. *Transfusion; 50(2):433-442.*

[51] Klitzman RL, Kirshenbaum SB, Dodge B, et al 92004). Intricacies and inter-relationships between HIV disclosure and HAART: a qualitative study. *AIDS Care, 16:628-640.*

[52] Lallement M (005). Response to the therapy after prior exposure to nevirapine. *3rd IAS Conference on HIV Pathogenesis and Treatment, Rio de Janeiro, Brazil, July 24–27. (Abstract TuFo0205).*

[53] Lovgren S (2001). African Army hastening HIV/AIDS spread. *Jenda: A Journal of Culture and African Women Studies*; 1, 2.

[54] Low SY, Eng P (2009). Human immunodeficiency virus testing in patients with newly–diagnosed TB in Singapore. *Singapore Med Journal,* 50(5):479–481.

[55] Mandisodza AR, Charuma H, Masoha A, Musekiwa Z, Mvere D, Abayomi A. (2006). Prevalence of HIV infection in school based and other young donors during the 2002 and 2003 period. *Afr J Med Med Sci; 35(1):69-72.*

[56] Manjunath JV, Thappa DM, Jaisankar TJ (2002). Sexually transmitted diseases and sexual lifestyles of long –distance truck drivers: A clinic-epidemiologic study in South India .*International Journal of STD and AIDS, 13:612-617.*

[57] Matthews, L. T., Mukherjee, J. S. (2009). Strategies for harm reduction among HIV-affected couples who want to conceive. *AIDS Behaviour, 13(1), 5-11.*

[58] Matthews, L. T., Baeten, J. M., Celum, C., Bangsberg, D. R. (2010). Periconception pre-exposure prophylaxis to prevent HIV transmission: benefits, risks, and challenges to implementation. *AIDS, 24(13): 1975-1982.*

[59] Meibohm A, Alexander JR J, Robertson M (2000). Early versus late initiation of indinavir (IDV) in combination with zidovudine (ZDV) and lamivudine (3TC) in HIV-infected individuals. *Seventh conference on retroviruses and opportunistic infections. San Francisco, January – February 2000.*

[60] Miller V, Staszewski S, Nisius G, Lepri AC, Sabin C, Phillips AN (1999). Risk of new AIDS disease in people on triple therapy. *Lancet, 353 – 343.*

[61] Mofenson LM, Lambert JS, Stiehm ER, et al (1999). Risk factors for perinatal transmission of human immunodeficiency virus type 1 in women treated with zidovudine. *N Engl J Med,* 341:385–393.

[62] Mofenson LM (2003). Advances in the prevention of vertical transmission of human immunodeficiency virus. *Semin Pediatr Infect Dis,* 4(4):295–308.

[63] Molla A, Korneveva M, Gao Q, et al (1996). Ordered accumulation of mutation in HIV confers resistance to ritonavir. *Nat Med, 2: 760 – 766.*

[64] Moore R, Kemly J, Barlet J, Chiasson R (2000). Start HAART early (CD4 < 350 cells/µl) or later? Evidence for greater effectiveness if started early. *Seventh conference on retroviruses and opportunistic infections. San Francisco, January – February 2000.*

[65] Muko KN, Ngwa VC, Chingan LC, Ngwa IG, Shu EN, Meiberg A (2004). Adherence to highly active antiretroviral therapy (HAART). A selection of reported case study from a rural area of Cameroon. *Medical Journal, 7:119-124.*

[66] National Agency for the Control of AIDS (NACA) (2009). National HIV/AIDS strategic framework (NSF) 2010-15.

[67] National Population Commission of Nigeria (1991). *Population Census of the Federal Republic of Nigeria: Analytic Report at the National Level.* Abuja: National Population Commission of Nigeria.

[68] Nemes MIB, Beaudoin J, Conway S, Kivumbi GW, Skjelmerud A, Vogel U (2006).Evaluation of WHO's contributions to 3'by 5':Annex 5:Regional Office and Country Visit Notes. WHO, Geneva.

[69] Nigerian exchange (2008). Ministry of Health alerts Nigerians to the transfusion of unsafe blood in hospitals.

[70] Noah D, Fidas G (2000). *The Global Infectious Disease Threat and Its Implications for the United States.* Washington, DC: National Intelligence Council, 2000.

[71] Nwauche CA, Erhabor O, Ejele OA, Akani CI (2006). Adherence to antiretroviral therapy among HIV-infected subjects in a resource-limited setting in the Niger Delta of Nigeria. African Journal of Health Sciences, 13 (3-4):13-17.

[72] Nwokoji UA, Ajuwon AJ (2004). Knowledge of AIDS and HIV risk-related sexual behaviour among Nigerian naval personnel. *BMC Public Health,* 2004; 4:24.

[73] Nyobi BM, Kristiansen KI, Bjune G, Muller F, Holm-Hansen C (2008). Diversity of human immunodeficiency type 1 subtype in Kegera and Kilimanjaro regions, Tanzania. *AIDS Res Hum Retroviruses,* 24(6):761–769.

[74] Odutolu O (2005). Convergence of behaviour change models for AIDS risk reduction in sub-Saharan Africa. *Int J Health Plann Manage*, *20(3):239-52*.

[75] Odutolu O, Ahonsi BA, Gboun M, Jolayemi OM (2006). AIDS in Nigeria: A nation on the threshold. The National Response to HIV/AIDS. Harvard Center for Population and Development Studies.

[76] Palella FJ, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, Aschman DJ, Holmberg SD (1998).Declining morbidity among patients with advanced human immunodeficiency virus infection.HIV outpatients study investigation. N Engl J Med, 338: 853-860.

[77] Pandey A, Benara SK, Roy N, Sahu D, Gayle H, et al (2008). Risk behaviour, sexually transmitted infections and HIV among long-distance drivers: a cross-sectional survey along national highways in India. AIDS, 22(5):S81-90.

[78] Physicians for Human Rights (2006) 'Nigeria: Access to Health Care for People Living with HIV and AIDS.

[79] Paterson DL, Swindell S, Mohr J, Bester M, Vergis EN, Squier C, Wagener MM, Singh N (2000).Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. Ann Intern Med, 133:21-30.

[80] PEPFAR (2008). FY2008 Country profile: Nigeria. Annual report to congress.

[81] Pieniazek D, Ellenberger D, Janini LM, et al (1991). Predominance of human immunodeficiency virus type 2 subtype in Abidjan, Ivory Coast. *AIDS Res Hum Retroviruses,* 15(6):603–608.

[82] Raufu A (2001). AIDS scare hits Nigerian military. *AIDS Anal Afr; 11*(5):14.

[83] Raufu A (2002). Nigeria promises free antiretroviral drugs to HIV positive soldiers. *Br Med J*; 13; 324(7342):870.

[84] Ruthbun RC, Farmer KC, Stephens JR, Lockhard SM (2005). Impact of an adherence clinic on behavioural outcomes and virologic response in treatment of HIV infection: a prospective randomized controlled pilot study. Clinical Therapy, 25:199-209.

[85] Salawu L, Murainah HA (2006). Pre-donation screening of intending blood donors for antibodies to infectious agents in a Nigerian tertiary health institution: a pilot study. *Afr J Med Sci; 35(4):453-456.*

[86] Sarin R (2003). *A New Security Threat: HIV/AIDS in the Military.* Washington, DC: World Watch Institute.

[87] Semprini A E, Vucetich A, Hollander L (2004). Sperm washing, use of HAART and role of elective Caesarean section. *Current Opinion in Obstetrics and Gynaecology, 16(6): 465-470.*

[88] Semprini, A. E., Fiore, S. (2004) b. HIV and reproduction. *Current Opinion in Obstetrics and Gynaecology, 16(3): 257-262.*

[89] Silver RL, Wortman CB, Crofton C (1990). The role of coping in support provision: the self-presentation dilemma of victims of life Crisis.In: Sarason BR, Sarason IG, Piece GR, eds. Social Support: An International view. New York: John Wiley and Sons: 379-426.

[90] Stanton CK, Holtz SA (2006). Levels and trends in caesarean birth in the developing world. *Stud Fam Plann,* 37(1):41–48.
[91] Stephenson J (2002). Cheaper HIV drugs for poor nations bring a new challenge: monitoring treatment. *JAMA,* 288(2):151–153.
[92] Sugihantono A, Slidell M, Syaifudin A, Pratjojo H, Utami IM, Sadjimin T, et al (2003). Syphilis and HIV prevalence among commercial sex workers in central Java, Indonesia: Risk-taking behaviour and attitude that may potentiate a wider epidemic. AIDS Patient Care and STDs, 17:595-600.
[93] Sunmola AM (2005). Sexual practices, barriers to condom use and its consistent use among long distance truck drivers in Nigeria. AIDS Care, 17:208-211.
[94] Tagny CT, Mbanya D, Tapko JB, Lefrère JJ (2008). Blood safety in Sub-Saharan Africa: a multi-factorial problem. Transfusion; 48(6):1256-261.
[95] Tchetgen E, Kaplan EH, Friendland GH (2001).Public health consequences of screening patients for adherence to highly active antiretroviral therapy. Journals of AIDS, 26: 118-129.
[96] The Global Fund (2009). Nigeria and the Global Fund.
[97] The World Bank (2008). Nigeria receives US million additional funding for HIV/AIDS project program.
[98] Thorne, CN and Patel, D and Fiore, S and Peckham, C and Newell, ML (2005) Mother-to-child transmission of HIV-1 in the era of highly active antiretroviral therapy. Clinical Infectious Diseases, 40 (3), 458 – 465).
[99] Tounkara A, Sarro YS, Kristensen S, Dao S, Diallo H, Diarra B, Noumsi TG, Guindo O (2009). Seroprevalence of HIV/HBV co-infection in Malian blood donors. *J Int Assoc Physicians AIDS Care (Chic Ill) ; 8(1):47-51.*
[100] UNAIDS (1998). *AIDS and the Military.* Best Practice Collection. Geneva.
[101] UNAIDS (2004). *AIDS Epidemic Update.* Geneva: UNAIDS, December 2004.
[102] UNAIDS (2005). Engaging Uniformed Services in the Fight Against HIV/AIDS. Accessed at https://uniformed services.unaids.org on July 8.
[103] UNAIDS/WHO (2005). *AIDS Epidemic Update: December 2005.* Geneva: UNAIDS.
[104] UNAIDS (2006).Report on the Global AIDS epidemic: May 2006.Joint United Nations Programme on HIV/AIDS.UNAIDS, Geneva.
[105] UNAIDS (2008). Uniting the World against AIDS Report on the global AIDS epidemic. Available t:http://www.unaids/en/KnowledgeCentre/HIVData/ Global Report /2008/2008_Global_report.asp. Accessed Aug 11, 2010.
[106] UNAIDS (2010). UNAIDS reporton the global AIDS epidemic.
[107] UNGASS (2010).UNGASS country progress report, Nigeria.
[108] United Nations Development Programme (2004). *Human Development Report.* New York: United Nations Development Programme: 141.
[109] U.S. Bureau of the Census, Population Division (1998). *International Programs Centre HIV/AIDS Surveillance Data.* Washington, DC: U.S. Bureau of the Census.
[110] UNDP 92007/2008). Human and income poverty: developing countries. In 2007/2008 human development report.
[111] Vanhove GF, Schapiro JM, Winters MA, Iversen A, Merigan TC (1996). Patient's compliance and drug failure in protease inhibitor monotherapy.JAMA, 276:1955-1956.

[112] van Leeuwen E, Repping S, Prins J M, Reiss P, van der Veen F. (2009). Assisted reproductive technologies to establish pregnancies in couples with an HIV-1-infected man. *Netherland Journal of Medicine, 67(8), 322-327.*

[113] Volberding P (2010). When and where to start: guidelines for the initiation of antiretroviral therapy. AIDS Reader, 10: 150 – 155.

[114] WHO (2008).WHO African region: Nigeria.

[115] WHO/UNAIDS/UNICEF (2007). Towards Universal Access: Scaling up Priority HIV/AIDS Interventions in the Health Sector. Progress Report, April 2007.WHO, Geneva.

[116] WHO/UNAIDS/UNICEF (2008). Towards Universal Access: Scaling up Priority HIV/AIDS Interventions in the Health Sector. Progress Report, WHO, Geneva.

[117] WHO/UNAIDS/UNICEF (2010). Towards Universal Access: Scaling up Priority HIV/AIDS Interventions in the Health Sector. Progress Report, WHO, Geneva.

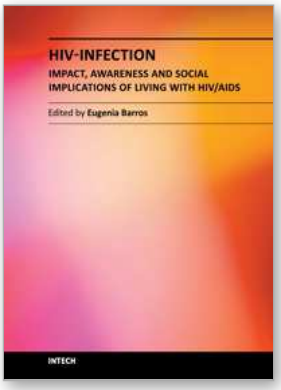
[118] World Bank (2004). Memorandum of the President of the International Development Association and the International Finance Corporation to the Executive Directors on a World Bank Group Second Joint Interim Strategy Progress Report for the Federal Republic of Nigeria.

[119] World Health Organization (2010). Rapid advice: Revised WHO principles and recommendations on infant feeding in the context of HIV.2009.Available at: http://whqlibdoc.who.int/publications/2009/9789241598873_eng.pdf.Accessed Aug 11, 2010.

[120] Yashioka MR, Schustack A (2001). Disclosure of HIV status: cultural issues of Asian patients. *AIDS Care STDs, 15:77-82.*

[121] Yusuph H (2005). Prevalence of HIV infection, in TB patient in Nguru, North Eastern Nigeria. *Sahel Medical Journal,* 8(3):65–67.

[122] Zohoun A, Lafia E, Houinato D, Anagonou S (2004). Risk of HIV-1 or 2 infections associated with transfusion in Benin. *Bull Soc Pathol Exot; 97(4):261-264.*



HIV-infection - Impact, Awareness and Social Implications of living with HIV/AIDS

Edited by Dr. Eugenia Barros

ISBN 978-953-307-343-9
Hard cover, 336 pages
Publisher InTech
Published online 26, October, 2011
Published in print edition October, 2011

The past few decades have seen the escalation of HIV-infections and the 'frantic' search for new drugs to treat the millions of people that live with HIV-AIDS. However because HIV-AIDS cannot be cured, but only controlled with drugs, and the Antiretroviral (ARV) treatment itself results in some undesirable conditions, it is important to generate wider awareness of the plight of people living with this condition. This book attempts to provide information of the initiatives that have been used, successfully or unsuccessfully, to both prevent and combat this 'pandemic' taking into consideration the social, economic, cultural and educational aspects that involve individuals, communities and the countries affected.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Osaro Erhabor, Oseikhuemen Adebayo Ejele, Chijioke Adonye Nwauche, Chris Akani, Eyindah Cosmos, Dennis Allagoa, Edward Alikor A.D., Ojule Aaron C., Hamilton Opurum, Orikomaba Obunge, Seye Babatunde, Nnenna Frank-Peterside, Sonny Chinenye, Ihekwaba E. Anele, Teddy Charles Adias, Emmanuel Uko, Agbonlahor Dennis E., Fiekumo Buseri I., Zacheus Awortu Jeremiah, Wachuckwu Confidence, Obioma Azuonwu, Abbey S.D., Onwuka Frank, Etebu Ebitimi N., Seleye-Fubara D. and Osadolor Humphrey (2011). Challenges Associated with the Effective Management of HIV Infection in a Low Income Setting in Sub Saharan Africa: Case Study of Nigeria, HIV-infection - Impact, Awareness and Social Implications of living with HIV/AIDS, Dr. Eugenia Barros (Ed.), ISBN: 978-953-307-343-9, InTech, Available from: http://www.intechopen.com/books/hiv-infection-impact-awareness-and-social-implications-of-living-with-hiv-aids/challenges-associated-with-the-effective-management-of-hiv-infection-in-a-low-income-setting-in-sub-

INTECH
open science | open minds

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821