



## Evaluation of Confounding HIV Sero-Prevalence and Associated Risk Factors among Subjects in Some Upland Communities of Niger Delta, Nigeria

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### Abstract

**Introduction and Aim:** The Human Immunodeficiency Virus (HIV) is a Retrovirus which can be transmitted through sexual intercourse, sharing of sharp objects, blood and breast milk thus, has been a massive public health concern over the years. Overtime, when left untreated, the virus would cause AIDS (Acquired Immune Deficiency Syndromes) which directly or indirectly leads to the disruption of certain activities of the body, especially the immune system. This study was thus aimed, at determining the prevalence of HIV in some communities in Ikwerre Local Government Area of Rivers State.

**Design and methods:** Whole venous blood was collected from 1000 randomly selected patients visiting the General hospital Isiokepo in Ikwerre Local Government Area and the sera obtained after centrifugation was used for the HIV antibody screening test. The Alere Determine Method was used for the assay while the STAT PAK kit was used for the confirmatory test. Results obtained were calculated in percentages and represented in charts.

**Results:** The results showed that 16.1% of the study population was HIV antibody sero positive from which persons within ages of 22-28 were the most infected (27.9%); females were more infected (55.3%) compared with males (44.7%) and the farmers had a higher prevalence rate of 26%, next was the unemployed with a prevalence of 24.8% when compared with those of other occupations. The unmarried/singles had the highest prevalence rate of 50.9% when compared with the married and widowed.

**Discussion and Conclusion:** Although the prevalence rate is tricky with huge confounding risk factors, the youths of this area should be encouraged to be engaged in meaningful work to keep them busy, especially the females to prevent them from partaking in unhealthy sexual and risky behaviors. The people should also be enlightened on the means of prevention of HI/AIDS. Provision of antiretroviral drugs for the positive patients will also help to prevent the development among the infected subjects to full blown AIDS.

**Keywords:** HIV; Risk factor; Prevalence rate; Unemployed; Youth; Remote upland communities; Niger delta

### Introduction

Human Immunodeficiency Virus (HIV) is a Lentivirus that can lead to Acquired Immunodeficiency syndrome (AIDS). This is a condition in which the immune system of Human begins to fail which paves way for opportunistic infections to thrive. Despite recent scientific efforts made in the discoveries and advances in understanding and controlling the virus that causes AIDS, this progress has little impact on the majority of HIV infected people and population living in developing countries. The social and economic conditions that support the viral spread have to be addressed, as important elements in local and global efforts to curb its spread and create effective solution to the increasing trend of the epidemic especially in developing communities [1].

Nevertheless, poverty, ignorance, abuse, violence and prejudice have given HIV epidemic outbreak wide opportunities to thrive among tragic human conditions. Social and economic circumstances contribute massively to vulnerability to HIV infection and intensify its impact, while HIV/AIDS generate and amplify the very conditions that enable that epidemic to thrive. As the virus destroys the Human immunity, it may as well rob families and communities of the Human assets and social structures needed for successful prevention and provision of care and treatment for persons living with HIV/AIDS [1]. Current estimates revealed that HIV is set to infect 90 million people in Africa, resulting in a minimum of 18 million orphans [2]. Nonetheless,

mortality and morbidity of HIV infection maybe bearably reduced by the administration of antiretroviral treatment and prompt diagnosis, but routine access to antiretroviral medication is not available in most of the developing countries, if not in all the countries of the globe [3].

However, it is primarily believed that, HIV infects defensive cells in the Human immune system such as helper T cells and makes them weak in their various functions towards protecting the body. HIV infection also leads to low levels of CD4<sup>+</sup> T cells through three main mechanisms: firstly direct viral killing of infected cells, secondly, increased rates of apoptosis in infected cells and thirdly, killing of infected CD4<sup>+</sup> T cells by CD8 cytotoxic lymphocytes that recognize infected cells. When CD4<sup>+</sup> T cell numbers decline below a critical level, cell-mediated immunity is lost, and the body becomes progressively more susceptible to opportunistic infections [4]. Most HIV infected individuals eventually

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develop AIDS, these individuals mostly die of opportunistic infections or malignancies associated with the continuous failure of the immune system. If no treatment is given, after 10-15 years of HIV infection, about 9 out of every 10 persons with the virus will progress to AIDS. Many progress much sooner depending on individual immunity [5]. Life expectancy of people infected with HIV is increased by consistent treatment with antiretroviral medication. Even after HIV has progressed to diagnosable AIDS, the average survival time with antiretroviral therapy (as of 2005) is estimated to be more than 5 years. [6]. It is hoped that current and future treatments may allow HIV-infected individuals to achieve a life expectancy of approaching that of the general public, if well diagnosed and managed in good time.

AIDS was first reported when the Centers for Disease Control and prevention (CDC) recorded a cluster of *Pneumocystis carinii* pneumonia (now still classified as PCP but known to be caused by *Pneumocystis jirovecii*) in five homosexual men in Los Angeles [7]. Initially, there was no official name for the disease. CDC often refers to it, by way of the diseases that were associated with it, for example, lymphadenopathy, and the disease after which the discoverer of HIV originally named the virus [8]. They also used Kaposi's sarcoma and opportunistic infections, the name by which a taskforce had been set up in 1981. In the general press, the term GRID, which stood for Gray-related immune deficiency, had been coined [9]. The CDC, in search of a name, and looking at the infected communities coined "the 4H disease", as it seemed to single out Haitians, homosexuals, hemophiliacs and heroin users. Nevertheless, after determining that AIDS was not streamlined to the homosexuals alone, the term GRID became misleading and AIDS was introduced at a meeting in July 1982. The CDC started using the name AIDS in September 1982, and there and then, the disease was properly defined and positioned till date.

Nevertheless, HIV has been shown to be transmitted through vaginal or anal sex without condom with someone who is infected, Mother-to-child-transmission (MTCT) (during pregnancy, during birth of the baby, or through breastfeeding), Using unsterilized sharp objects or receiving an injection from an unsterilized needle that was previously used by someone with HIV, through heterosexual route, improperly screened blood for transfusion or blood contact from someone who is infected with HIV. Furthermore, it can be found in the blood, semen, pre-seminal fluid or vaginal fluid of a person infected with the virus; the lining of the vagina can tear and allow HIV to enter the body; direct absorption of HIV through the mucous membranes that line the vagina is also a possibility; In the body of the male, HIV can pass through urethral opening or small cuts or open sores on the penis and infect the unsuspected victim.

The AIDS pandemics can also be seen as several epidemics of separate subtypes; the major factors in its spread are sexual transmission and vertical transmission from mother to child at birth and through breast milk [10]. It is said to have claimed an estimated 2.1 million (range 1.9-2.4 million) lives in 2007 despite improved access to antiretroviral treatment, of which an estimated 330,000 were children under 15 years [2]. Worldwide, 33.2 million people are estimated to be living with HIV in 2007, including 2.5 million children. An estimated 2.5 million (range 1.8-4.1 million) people were newly infected in 2007, including 420,000 children [2]. In 2007, Sub-Saharan Africa contained an estimated 68% of all people living with AIDS and 76% of all AIDS deaths, with 1.7 million new infections bringing the number of people living with HIV to 22.5 million, and with 18 million AIDS orphans living in the region. By this estimation, Sub-Saharan Africa maintains the worst hit. Unlike other regions, most people living with HIV in Saharan Africa 2007

(61%) were women. The prevalence rate of adults living with AIDS in 2007 was estimated at 5.0% and AIDS continued to be the single largest cause of mortality in this region. South Africa, followed by Nigeria and India has the largest population of HIV patients in the world. South and South East Asia are second worst affected; in 2007 this region contained an estimated 2.5 million infection and an estimated adult prevalence of 0.36%. Life expectancy has fallen dramatically in the worst-affected countries; for example, in 2006, life expectancy in Botswana had dropped from 65 to 35 years [11]. Sub-Saharan Africa accounted for 72.7% of the world's AIDS-related deaths and 67.6% of the world's HIV infection [12].

Nigeria is the most populous in Africa with an estimated 3 million HIV infected persons. About 50,000 to 100,000 children are born yearly in Nigeria with HIV. Its HIV/AIDS prevalence rate is 3.4% while that of Rivers State is 15.2% [13]. The study was thus, aimed at determining the prevalence and risk factors of HIV infection in some remote communities in Ikwerre Local Government Area in Rivers State that access the General Hospital Isiokpo as a point of call for their health needs, given the increasing trend of lack of access to functional health facilities in the communities that are close to the subjects. The hospital is a central one visited by most sick persons in the Local Government Area. More often when persons come with certain signs and symptoms, they are believed to have malaria or typhoid which may be a wrong diagnosis in some cases. It is strongly believed that the results generated will thus, provide epidemiological data on HIV prevalence in the screened communities, as most of the HIV programmes and intervention in the region has always focused its targets in the urban cities of the state, hence leaving those in the remote communities with no access to HIV intervention advocacies and health education outcome.

## Materials and Methods

### Study population/design

Ikwerre, an ethnic group in Rivers State of Nigeria is made of four Local Government Areas- Emohua, Obio Akpor, Port-Harcourt, and Ikwerre Local Government Areas. The people depend mainly on farming since there is large expanse of land. The farming is done either at subsistence or commercial level. At the commercial level, the produce are sold for earn income. Some others are artisans and engage in other means of earning income. Christianity is widely practiced in this region. This study was carried out in Ikwerre Local Government Area of Rivers State of Nigeria where Isiokpo General Hospital is Located. Isiokpo is the Headquarter of Ikwerre Local Government Area of Rivers State, Nigeria. The Hospital is well equipped with Medical and Laboratory facilities and has an average of 200 outpatient attendances daily, where at least 20 patients that come to the laboratory daily were screened for Human Immunodeficiency Virus (HIV) infection between July 2008 to November 2008 respectively. This study was carried out irrespective of the age and gender of the patients. The demographic data of the patients such as age, marital status, occupation and sex were taken through a self-administered questionnaire.

### Inclusion criteria

The subjects must be willing to participate and also with due consent approval. The subject must be residing in Ikwerre local government Area and has not been previously be diagnosed of HIV infection.

### Exclusion criteria

Not willing to participate in the research hence no consent approval provided. Also subjects who are not residing in the communities are

excluded, even as subjects who are already diagnosed of HIV were also removed from the study.

## Experimental

### Specimen collection

Whole venous blood (2.5 ml) was collected from the patients with syringe and placed in clean vial bottles. The blood was allowed to clot and the serum separated by centrifugation and stored at  $-20^{\circ}\text{C}$  until when analyzed.

Detection of antibodies to Human Immunodeficiency Virus type 1 and 2 was done using Alere determines kit and Stat-Pak Kit manufactured by Alere Medical CO. Ltd Japan and CHEMBIO Diagnostic systems, INC, USA respectively. The Alere determine kit was first used; reactive tests were repeated at least once to avoid false positive results and confirmed using Stat-Pak kit. The kits were used in accordance with the manufacturers' Standard Operating Procedure respectively.

### Determine method

**Principle:** Sample is added to the sample pad. As the sample migrates through the conjugate pad, it reconstitutes and mixes with the selenium colloid antigen conjugate. This mixture continues to migrate through the solid phase to the immobilized recombinant antigens and synthetic peptides at the patient window site. If antibodies to HIV-1 and HIV-2 are present in the sample, the antibodies bind to the antigen-selenium colloid and to the antigen at the patient window forming a red line at the patient window site. If antibodies to HIV-1 and/or HIV-2 are absent, the antigen-selenium colloid flow past the patient window and no red line is formed at the patient window site.

The procedure involved using a precision pipette to drop 50  $\mu\text{l}$  of serum sample on the sample pad and after 15 minutes, the results were read. Two bars, one in the control and one in patient window indicated a positive result; one bar in the control indicated a negative result while no bar indicated an invalid result.

**Stat-Pak method:** STAT-PAK assay is a single-use immunochromatographic rapid screening test for the detection of antibodies to Human Immunodeficiency Virus types 1 and 2 (HIV1/2) in finger stick whole blood, venous whole blood, serum or plasma specimens.

**Principle:** HIV 1/2 STAT-PAK assay employs the combination of a specific antibody binding protein, that is congregated to a colloidal gold dye particles, and HIV1/2 antigens which are bound to the membrane solid phase. It is based on the binding of antibodies to the antigens. The sample is applied to the sample(s) well followed by the addition of running buffer. The buffer facilitates the lateral flow of the released products the binding of antibodies to the antigens. If the antibodies are present, they bind to the gold conjugated antibody binding protein. In a reactive sample, the dye conjugated-immune complex migrates on the nitrocellulose membrane and is captured by the antigens immobilized in the test (T) area producing a pink line. If HIV antibodies are absent, there is no pink line in the test (T) area.

The STAT-PAK test was removed from its pouch and placed on a flat surface; the test device was labeled with the patients identification number; the 50  $\mu\text{l}$  sample loop was touched on the specimen, and the opening of the loop filled with the liquid; the sample loop was held vertically, and made to touch the pad at the center of the sample(S) well of the device to dispense 50  $\mu\text{l}$  of the sample (serum) into the sample

pad; the running buffer bottle was inverted and held vertically over the sample well; 3 drops of the buffer was added slowly, drop wise, into the sample(S); after the addition of the running Buffer, the results were read within 10 minutes.

### Statistical Analysis

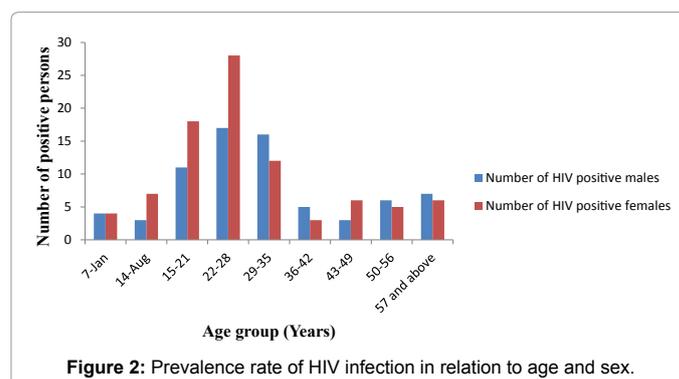
SPSS 11.0 Window statistical computer data base was used to analyze the data. The data was grouped into age group, occupation, marital status, and percentage prevalence. Chi-square was used to test for independence between percentage (%) prevalence in each of the groups. An error probability (p value) of  $<0.05$  was considered not significant in all the statistical comparisons.

### Results

A total number of 1000 persons within different age groups were screened for Human Immunodeficiency Virus (HIV) antibodies. Out of this number screened, 161 persons tested positive for HIV seropositive, representing a prevalence rate of 16.1% ( $X^2$  81.054,  $P>0.05$ ) of the total population screened.

Figure 1 shows the age distribution of the persons tested. From this figure, majority of the persons tested were within ages 22-28. Figure 2 shows the prevalence rate of HIV in relation to age and sex. The rate of HIV infection was highest within ages 22-28 with a prevalence of 27.9% ( $X^2$  25.373,  $P$  value  $>0.05$ ). This is followed by the age group 15-21 with a prevalence rate of 18.0% ( $X^2$  4.272,  $P>0.05$ ). The lowest prevalence rate occurred in the age group of 57- above, with a prevalence rate of 8.0% ( $X^2$  0.870,  $P<0.05$ ). It also showed that the gender with the highest number of positive cases was females with 89 cases (55.3%) compared with males who were 72 (44.7%) in number still within this age bracket.

Figure 3 shows the prevalence rate of HIV infection in relation to occupation. The highest prevalence of HIV infection occurred among the farmers (26.0%) ( $X^2$  5.221,  $P>0.05$ ). This is followed by the applicants, with a prevalence of 24.8% ( $X^2$  3.965,  $P>0.05$ ). The lowest



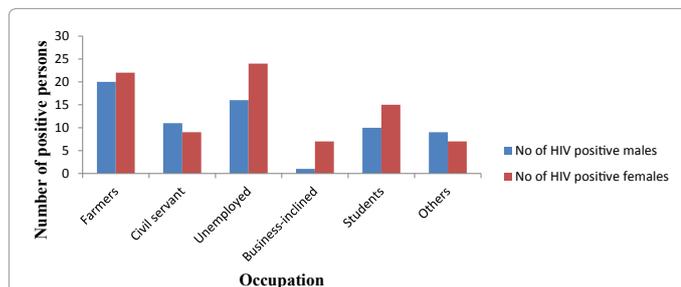


Figure 3: Shows the prevalence rate of HIV infection in relation to occupation.

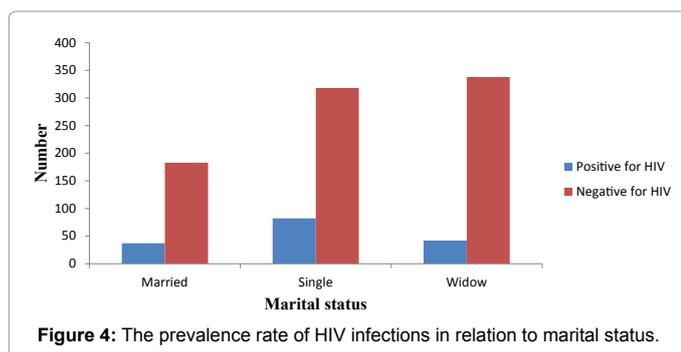


Figure 4: The prevalence rate of HIV infections in relation to marital status.

prevalence occurred among others, with a prevalence rate of 9.9% ( $X^2$  2.749,  $P < 0.05$ ).

Figure 4 shows the prevalence rate of HIV infection in relation to marital status. From this table, the highest prevalence occurred in the singles/not married, with a prevalence of 50.9% ( $X^2$  9.259,  $P > 0.05$ ). Married showed the lowest prevalence of 22.9% ( $X^2$  0.529,  $P < 0.05$ ).

## Discussion

The HIV infection which leads to AIDS has been a public health concern as well as global health threat, thus this has increased the need for determining its prevalence in different locations of the world so as to build a very strong impetus and strategy on how to manage the scary scourge. This study was aimed at determining the prevalence of Human Immunodeficiency Virus (HIV) infection in rural households/communities of Ikwerre Local Government Area of Rivers State, Nigeria. This was achieved by correlating the effect of some risk factors such as the marital status, age, sex and occupation of the people the remote communities assayed.

The overall prevalence rate observed in this study was 16.1%. The value obtained in this study is however less than that reported in the Northern Eastern part of Nigeria by Baba et al. [11] Sirisena et al. [14] and Ejele et al. [15]; but more than that recorded by Okerentugba et al. [16] who recorded a prevalence of 3% from samples of pregnant women collected from a Cottage hospital at Rumubiakani, Port Harcourt. Lower results were recorded in Osogbo and Enugu which had a prevalence rate of 3.1% and 3.5% respectively [17,18]. This result is also higher than that obtained in the study conducted by Azuonwu et al. [19] in Ogba/Egbema/Ndoni Local Government Area in the same state where the prevalence rate was 10.57%. Among pregnant women and STD patients in Ibadan, a prevalence rate of 28.6% 10.8% respectively [20]; zero prevalence among blood donors in Ibadan [21] and 11.0% among pregnant women in Port Harcourt [22]. Another study on co-infection in the North Western part of Nigeria recorded a prevalence rate of 12.1% for HIV-2 and 0.5% for HIV-2 [23,24] respectively.

The higher prevalence rate may be due to the number of samples collected for this study as most of the other studies carried out make use of sample size less than 1,000. Also, the hospital is the only government owned general hospital within the area which makes it possible for majority of the indigenes of the Area to visit it as their main source of medical attention facility.

The prevalence of HIV infection was found in this study to be higher among females than males. The study carried out by Azuonwu et al. [19] also affirms this as females had a prevalence of 7.61% as against 2.96% in males. Also, the findings of Azuonwu et al. [25] stated that for every infected male, there as a corresponding 12 to 13 HIV infected females. This observation may have been accounted for by the fact that women are more vulnerable to the infection due to probably multiple sexual partners for exchange of gifts (such as money) or favors or be involved in risky behaviours that make them vulnerable to HIV infection such as prostitution. In some cases, females are raped which also exposes them to the virus at the early stage of life. This study however is in difference to that by Azuonwu et al. [26] who reported that among oil workers and students, females had a lower prevalence compared with males.

This study shows that the age group most affected with the infection is between 22-28 years, 27.9% ( $X^2$  25.373,  $P > 0.05$ ). This is the peak age for sexual demand and other activities like barbing and plating of hair using unsterilized objects like clippers and needles for men and women respectively. Youths often want to explore and possibly practice what they see in the movies and this prompts there partaking in these activities that probably predispose them to HIV infection.

Considering occupation, the farmers 26.0% ( $X^2$  5.221,  $P > 0.05$ ) and applicants, 24.8% ( $X^2$  3.965,  $P > 0.05$ ) respectively, recorded the highest rate of HIV infection. This finding is in agreement with Ejele et al. and Obire et al. [15,27] These findings may probably be due to poverty resulting from unemployment among the applicants as such in exchange for financial, academic or other kind of help, they give in to sex. In some cases, the females are left to fend for themselves at an early age exposing them to early sex. During farming, some farmers share their sharp farm equipment which predisposes them to HIV infection if a wounded infected person had previously used it. Also, most farms are located in remote places distant from inhabited areas providing a good room for rape.

This study also shows that among the marital status group, the singles/not married and widows/separated with a prevalence of 5.09% ( $X^2$  9.259,  $P > 0.05$ ) and 26.0% ( $X^2$  13.52,  $P > 0.05$ ) respectively, are more affected with the infection. This finding is in agreement with Varghese et al. [28]. This observation may have been accounted for by the fact that singles/non married and the widows/separated are more likely to be involved in maintaining multiple sex partners or may be involved in unhealthy sexual behaviours that make them vulnerable to HIV infection. This situation is very risky itself given the fact that in most of the villages where this study was conducted, there is evidence of lack of functional health care facilities that are close and accessible to the people for continuous monitoring and management of HIV patients as also reported by Azuonwu et al. [29] in their previous study. Furthermore, absence of functional diagnostic centres and trained biomedical scientist to perform the needed assay as at when due, may tend to increase the burden of increasing trend of HIV incidence [29], coupled with government weak health policies towards improving the health of the weak and most vulnerable in the society, especially in the remote communities where poverty and lack of awareness remains a huge risk factor to HIV spread [30].

## Conclusion

The impact and the prevalence of HIV infection in Ikwerre Local Government Area of Rivers State had been ascertained. Women are not only more physically vulnerable to HIV infection than men, but also are more susceptible to negative social and economic outcomes caused by the epidemic. Nevertheless, upon the death of their husbands, women lose access and control of the husband assets through which they could earn a living (land, water, livestock, credit and information). Furthermore, this study serves as a pointer for additional call to duty for all stakeholders; it is therefore imperative to sensitize the public on efforts to reduce the incidence of HIV infection and provide possible means of curbing the infection especially in the remote communities where access to functional health facility remains a huddled challenge. The vulnerable groups (women, the unemployed and youths especially) should be given attention to reduce the prevalence of HIV in the area by empowering them economically and educationally.

We strongly recommend that the result obtained in this study be used as a working epidemiological data on the impact and prevalence of HIV infection in Ikwerre Local Government Area of Rivers State and Nigeria at large. It is also strongly suggested that immediate interventional measures be taken by the government and other health agencies with the hope of prioritizing preventive measures such as health education of the general populace and discouraging massive risky clinical and cultural practices that promote transmission of HIV such as the transfusion of unscreened blood and blood products, injecting using unsterilized needles, sharing of blades and sharp objects used for scarification, barbing, ear piercing and circumcision. There should be public awareness campaign on the scourge of HIV/AIDS.

The government should assist in the provision of anti-retroviral drugs at no or low cost and these drugs should be made readily available for the people of this region to prevent the spread of AIDS. Primary health care delivery should be strongly underpinned through the provision of health care facilities and trained medical personnel. We suggest strongly that the graduates in this region should be given employment and the non-graduates encouraged to learn some skills through the skill acquisition programme. The fight against HIV/AIDS should not only be for the government alone, but also for individuals, corporate organizations, companies, Non-Governmental Organizations (NGO'S.) etc. People should show care and love to persons living with HIV/AIDS (PLWHA). Stigma and discrimination should be discouraged at all levels, we strongly opined.

## Ethical Consideration

The ethical approval for this community based research was gotten from the Department of Medical Laboratory Science ethical committee of the Rivers State University and the General Hospital Isiooko, Medical laboratory Unit, where this study was anchored.

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## References

1. Mariam L (2008) The impacts of HIV/AIDS on children, families and

communities: Risks and realities of childhood during the hiv epidemic. *HIV Development Prog* 30: 1-8.

2. WHO (2007) AIDS epidemic update.
3. Bell C (2008) The long-run economic costs of AIDS: World bank policy.
4. Goodier JL, Kazazian HH (2008) Retrotransposons revisited: The restraint and rehabilitation of parasites. *Cell* 135: 23-25.
5. Gallo RC (2006) A reflection on HIV/AIDS research after 25 years. *Retro virology* 3: 72.
6. Palella FJ (2008) Declining morbidity and mortality among patients with advanced HIV infections. HIV outpatient study investigators. *New Eng J* 338: 853-860.
7. Smith D (2005) HIV superinfection. *J Infect Disease* 192:438-44.
8. Muciaccia B (2005) Evidence for frequent reinfection with hiv type 1 of a different subtype. *J Virol* 79: 10701-10708.
9. Coovadia H (2005) Antiretroviral agents. *New Eng J Med* 351:289-292.
10. Kallings LO (2008) The first postmodern pandemic: 25 years of HIV/AIDS. *J Int Med* 263: 218-243.
11. Sirrisena ND, Njoku MD, Idoko JA (2002) Hepatitis B surface antigenemia in patients with human immunodeficiency virus-1 (hiv-1) infection in jos, Nigeria. *Nigeria Med Prac* 41: 18-20.
12. National HIV and AIDS and reproductive health survey.
13. WHO (2015) HIV/AIDS fact sheet.
14. Baba MM, Gashau W, Hassan AW (2000) Detection of Hepatitis B surface antigenaemia in patients with and without the manifestation of aids in maiduguri, Nigeria. *Postgraduate Med J* 5: 125-127.
15. Ejele OA, Nwauche CA, Erhabor O (2004) Prevalence of Hepatitis B surface antigenaemia in HIV positive patients in the niger delta Nigeria. *Nigeria J Med* 13: 2.
16. Okerentugba PO, Uchendu SC, Okonko IO (2015) Prevalence of HIV among pregnant women in rumubiakani, port harcourt, Nigeria. *Public Health Res* 5: 58-65.
17. Buseri FI, Muhibi MA, Jeremiah ZA (2009) Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. *Blood Trans* 7: 293-299.
18. Chukwurah EF, Nneli RO (2005) Prevalence of transfusion transmissible infectious disease markers among blood donors in a south eastern state of Nigeria. *Nigerian Biomed Sci J* 1: 114-117.
19. Azuonwu O, Ihua A, Wokem GH, Igwe C (2017) Prevalence of Human Immunodeficiency Virus (HIV) antibody among subjects in ogba/egbema/ndoni local government area (lga) of rivers state of Nigeria. *Trans Biomed* 8: 118.
20. Motayo OB, Okonko IO, Uche LN, Onoja BA, Obiogbolu CH (2009) The seroprevalence of Human Immunodeficiency Virus (HIV) among patients attending the special treatment clinic at university college hospital, ibadan, Nigeria. *Nigerian J Microbiol* 23: 1904-1910.
21. Alli JA, Okonko IO, Abraham OA, Kolade AF, Ogunjobi PI, et al. (2010) A serosurvey of blood parasites (*Plasmodium*, *microfilaria*, HIV, HBsAg, HCV antibodies) in prospective nigerian blood donors. *Res J Med Sci* 4: 255-275.
22. Frank-Peterside N, Okonko IO, Okerentugba PO, Jaja N (2012) Detection of HIV 1 and 2 antibodies among pregnant women in port harcourt, rivers state, Nigeria. *World App Sci J* 16: 589-598.
23. Abdulazeez A, Alo E, Naphthali R (2008) Concurrent infection of HIV-1 and HIV-2 serotypes in Adamawa State Nigeria. *World J Med Sci* 3: 15-18.
24. Nsagha DS, Njunda AL, Kamga HLF, Assob JCN, Bongkem EA (2012) HIV-1/HIV-2 co-infection among voluntary counselling and testing subjects at a regional hospital in cameroon. *African Health Sci* 12: 276-281.
25. Azuonwu O, Erhabor O, Obire O (2012) HIV among military personnel in the niger delta of Nigeria. *J Comm Health* 37: 25-31.
26. Azuonwu O, Obire O, Nwankwo ME (2010) Prevalence and risk factors of human immunodeficiency virus (HIV) in Ndoki communities of Nigeria. *J Pharm Res* 3: 1607-1611.

27. Obire O, Nwankwo UJ, Ramesh RP (2009) Incidence of HIV and AIDS in Ahoada, Portharcourt, Nigeria. *Elec J Biol* 5: 28-33.
28. Verghese B, Maher JE, Peterman TA, Branson BM, Stekete RW (2002) Reducing the risk of sexual hiv transmission: quantifying the per-act risk for hiv on the basis of choice of partner, sex act and condom use. *Sexual Trans Dis* 29: 38-43.
29. Azuonwu O, Nnenna I, Douglass AS, Ntaa NB (2016) Consequences of haemolytic disease of the fetus and newborn (HDFN) and the clinical significance of antibody screening in prenatal diagnosis: A study of multigravida and primigravida women in port harcourt, niger delta.
30. zuonwu O, Nnenna Ihua, Oritsemisan S (2017) Evaluation of co-morbidity impact of diabetic disorders on some haematological profile of patients assayed in port harcourt, niger delta, Nigeria: A public health concern.