Published in final edited form as:

Curr Opin Oncol. 2009 September ; 21(5): 455–461. doi:10.1097/CCO.0b013e32832e6385.

Challenges in Treating Malignancies in HIV in Nigeria

Oluyemisi Akinwande, MD, MPH¹, Temidayo Ogundiran, MD, MHSc⁴, Sally Anthony Akarolo, MD¹, Ibrahim Mamadu, MD¹, Patrick Dakum, MD, MPH^{1,2}, William Blattner, MD^{1,2,3}, and Clement Adebamowo, MD, ScD^{1,2,3}

¹Institute of Human Virology, Abuja, Nigeria ²Institute of Human Virology, University of Maryland

³Department of Epidemiology and Preventive Medicine, University of Maryland ⁴Division of Oncology, Department of Surgery, University of Ibadan, Ibadan, Nigeria

Abstract

Purpose of Review—Sub-Saharan Africa has the largest population of people living with AIDS in the world with Nigeria having the third largest after South Africa and India. With the advent of treatment programs, more people in Nigeria are now living with the virus but are at increased risk of cancer similar to the experience in other parts of the world. This review uses publications on HIV associated cancers emanating from Nigeria in 2008 to map the current landscape of prevention, diagnosis and treatment of these conditions. The opportunities and challenges identified in this review will provide a template for designing appropriate clinical and public health intervention to stem another epidemic, this time of AIDS associated malignancies.

Recent findings—There is a paucity of literature on AIDS associated cancers from Nigeria and most reports are based on hospital or pathology case series. Poor case identification and diagnosis, and rudimentary cancer registration militate against adequate quantification of the prevalence of AIDS associated cancers in Nigeria. Several initiatives, working with the HIV treatment programs, governmental and non-governmental local and international agencies are rising to the challenge and creating new opportunities for cancer prevention, treatment and research that takes advantage of improved treatment infrastructure provided for PLWA.

Summary—Nigeria is about to witness substantial increase in the background incidence of cancers due to high prevalence of HIV and expanded treatment programs. Creative methods are needed to deploy effective prevention, case identification, registration and treatment programs that are consistent with the socio-economic development of the country.

Keywords

Nigeria; HIV/AIDS; Malignancy

Introduction

Since the advent of the HIV epidemic, the disease has spread throughout the world. In 2007, there were about 33 million people living with HIV with 3.0 million annual infections and 2.0 million deaths, making it the most destructive epidemic of modern times.[1] Sub-Saharan Africa is the worst hit, with 67% of the global population of infected persons.[1] Nigeria, with a population of more than 148 million people, about 69 million of whom are in the at risk age

group of 15 to 49 years old[2], has the third highest population of people living with HIV/AIDS (PLWA) in the world, between 2.0 and 3.2 million in 2007, after South Africa and India.[1] In 2007, the seroprevalence amongst adults aged 15 to 49 in Nigeria was 3.1 (95% CI, 2.3, 3.8) with significant regional variations.[1] (Figure 1)

In the untreated, the severe immunodeficiency that accompanies HIV infection results in significant morbidity and mortality from infections caused by a wide variety of microbes, including opportunistic ones. This results in classic AIDS-defining illness of chronic ill health, frequent diarrhea, cough, weight loss, fever, anemia, and neurological deterioration.[3*] In the last few years, there has been concerted international action to stem the tide of the HIV epidemic in the worst affected countries of the world by initiatives such as the President's Emergency Program for AIDS Relief (PEPFAR), and the Global Fund to Fight AIDS, Tuberculosis and Malaria.[1] This resulted in the rollout of treatment and prevention programs that has increased access for a previously un-served population. Nigeria is one of the target countries for these programs which has been supported by strong local political leadership

In general, in populations where treatment for HIV/AIDS is available, individuals with HIV are now living longer and in relatively good health with the disease. In such populations, malignancies have become the single most important cause of morbidity and mortality.[4] The association between HIV infection and malignancies was noticed shortly after the infection was recognized when series of publications highlighted the linkage by showing higher incidence of Kaposi Sarcoma (KS), Non-Hodgkin's lymphoma (NHL) and Cervical cancer among persons living with HIV/AIDS compared with the general population.[5] This led the Centers for Disease Control and Prevention to classify these 3 cancers as AIDS-defining.

In developed countries, where there is now a large number of individuals who have been treated with Highly Active Anti-Retroviral Treatment (HAART) since its advent in 1996, studies are showing that the incidence of AIDS-defining cancers are stabilizing or reducing while those of cancers of the lungs, kidneys and Hodgkin's Lymphoma are rising among PLWA compared to the general population.[6] The history of treatment of HIV in most African countries including Nigeria is much shorter compared to the developed countries. In Nigeria, as in most of the developing world, treatments became widely available only from about the year 2002. Therefore the spectrum of malignancies that are currently being seen in PLWA reflect this much shorter treatment history.

Globally, approximately 12.4 million cases of cancer occurred in 2008. with 7.6 million deaths.[7] Most of these new cancers are occurring in low and middle income countries (LMIC); same countries with large ongoing HIV epidemics. This trend towards higher prevalence in LMIC will increase in coming years because of increasing world population, aging and changing pattern of risk factors that are leading to increases in incident rates.[7] Currently, the WHO reports that cancer is the second commonest cause of mortality after cardiovascular diseases and ahead of tuberculosis, HIV and malaria. HIV infection is a major contributor to this trend. Data about the prevalence of cancer in Africa is scarce as only 7.2% of the population is covered by cancer registries. It is estimated that there were 667,000 incident cases and 518000 deaths from cancer in Africa in 2008.[7] The commonest cancers in African men are Kaposi Sarcoma (due largely to HIV), liver and prostate cancer while in women, they are cancer of the cervix uteri, breast and liver.[7]

HIV/AIDS associated malignancies in Nigeria

In Nigeria as in other developing countries, the incidence of cancers is increasing, driven by demographic change with more people living to cancer bearing age, changing lifestyle, dietary, obstetric and gynecological practices. In addition, infectious causes of cancer continue to constitute a greater proportion of the etiology of cancers in Nigeria as in other developing

compared to developed countries. However, accurate information about cancer in Africa is difficult to obtain, hampered as it is by several factors. Most information about cancer occurrence, including those reviewed in this paper, often come from clinicians and pathologists retrospectively reviewing hospital case series.[8] These tend to be biased by overrepresentation of easily diagnosed cancers while cancers occurring in hard to biopsy areas like the brain, viscera and lungs are under-represented.[8] They are also biased by the types of services, interest of clinicians and infrastructure available in the hospitals where the studies emanate. Cancer registration, which should be a reliable source of population level data, is uneven and there are very few functional population based cancer registries hence population level data about incidence of cancer is difficult to come by.

Cancer of the cervix

The most reliable data available suggest that the incidence of cancer of the cervix uteri in Nigeria was 19.9 per 100,000 in 1999 making it the second commonest cancer in women after breast cancer whose incidence was 25.3 per 100,000 women at that time.[8] There is significant variation in the regional incidence of cancer of the cervix compared to that of the breast with cervical cancer being commoner in some parts of the country and vice-versa. The incidence of cancer of the cervix is higher in the relatively less urbanized parts of Nigeria compared to urban areas where the population has more quickly adopted modern lifestyle. High prevalence of cervical cancer in Nigeria predates the HIV epidemic and the most important risk factor for cervical cancer as in other parts of the world is Human Papilloma Virus (HPV), particularly serotypes 16 and 18.[9] In Nigeria, the age-standardized prevalence is 25.6% (22.4-28.8) in Nigeria.[9] Whereas an inverse relationship between age and human papillomavirus prevalence has been reported in many developed countries, this is not the case in Nigeria where there is high prevalence across all age spectrums.[10] It is debatable whether HIV infection increases the risk of cervical cancer but rather similarity in etiological risk factors, particularly multiple sexual partners may be responsible for the association between these two conditions.[11-13] New data imply that the problem of HPV-related cancers will not decline among HIV-positive women in the antiretroviral therapy era.[14] Nevertheless some studies have suggested that there is increased prevalence of cervical dysplasia and squamous intra-epithelial lesions in HIV positivewomen.[12]

In 2008, there were 12 publications about cervical cancer from Nigeria indexed in PubMed. [15-27] There may be other publications in local journals that are not indexed by PubMed but these are not likely to be of greater quality than the ones indexed. Two of these studies used data from hospital based cancer registries in Northern Nigeria.[16,17] One of these two papers identified cancer of the cervix as the commonest malignancy in the city of Kano in northern Nigeria[17] while the other showed that squamous cell carcinoma followed by adenocarcinoma were the commonest histological types.[16] We are aware of only one study that systematically examined cervical cancer among HIV patients during the period under review and this is not yet published. (Agaba P. *et al.* Cervical neoplasia in Nigerian women infected with HIV *in press*) Nevertheless, the study showed that cervical cytology was abnormal in 252 (68.3%) of 369 study participants. The median CD4 count was lower for those with neoplasia compared to those without while median viral load was higher in those with neoplasia compared to those without. Viral load >10,000 copies/ml, low CD4 count and evidence of HPV infection were significantly associated with cervical neoplasia

Kaposi sarcoma

Kaposi sarcoma (KS) is classified into classic (sporadic), endemic (African), epidemic (AIDS-related) or immunosuppression associated varieties.[8] In all of these variant forms, the causative agent is Kaposi Sarcoma associated Herpes Virus (KSHV).[7] In Nigeria, in the early

stages of HIV/AIDS epidemic, the incidence of KS was 0.1 per 100,000 persons in 1999 but this statistic has not been updated since the advent of the HIV/AIDS epidemic.[8] There were 5 publications about KS indexed in PubMed from Nigeria in 2008.[28-32] All the publications were either retrospective case or pathological materials review or case reports and they suggest rather low prevalence of KS despite the prevalence of HIV. Data from other countries show that KS has become the commonest cancer in men and the fourth commonest in women, after cervix, breast and liver.[7] The low prevalence reported in these few publications from Nigeria is largely due to underreporting and the fact that the disease tends to resolve once patient starts ART. In PLWA, the age of onset of KS is earlier than in endemic KS and there is a male predominance which has declined from 10:1 in the pre-HIV era to about 3:1 and falling.[7] In patients not receiving anti-retroviral therapy (ART), the disease tends to affect multiple sites, run a rapid clinical course and has a poorer prognosis than the endemic variety.[7]

Non-Hodgkin's lymphoma

The relative frequency of Non-Hodgkin's lymphoma (NHL including Burkitt's lymphoma) in Africa is the subject of some controversy.[8] This may be due to true change in incidence; improved diagnosis and availability of treatment and other services for other cancers, and not actually due to a true change in incidence of NHL itself. Advanced immunosuppression is the commonest risk factors for Non Hodgkin's lymphoma (NHL).[7] In the period under review, apart from some case reports, case reviews and an earlier mentioned analysis of data from the Kano Cancer Registry, there were no substantial publications about NHL among PLWA in Nigeria.[17,33-38] NHL is most probably largely underdiagnosed because of poor diagnostic oncology facilities and confusion with tuberculous lymphadenopathy and the lymphadenopathy of HIV infection.

Non-AIDS defining malignancies

Non-AIDS defining malignancies (NADM) have been described as the sleeping giant of the HIV/AIDS era.[39] The incidence of NADM has increased 1.7 to 3 times in PLWA and the reasons for this include immune suppression and reconstitution, increased survival on treatment, increased prevalence of behavioral risk factors, and possible effects of ART.[40, 41] Cancers of the lungs, kidneys, head and neck, hematopoietic system and conjunctiva as well as Hodgkin's lymphoma have increased in incidence among PLWA receiving ART.[40, 41] Among the common male and female cancers that are not generally thought to be associated with AIDS in Nigeria are breast and prostate cancers, the incidence of both of which does not tend to increase in PLWA in parallel with that of either AIDS-defining or Non-AIDS defining cancers.[41] Another NADM whose incidence has increased in the HAART era is liver cancer. [42*] However despite its high prevalence, there was no systematic study of HIV and liver cancer in Nigeria during the period under review. Infrequent association of liver cancer and HIV/AIDS in Nigeria may also be due to different etiological factors in liver cancer in Nigeria compared to developed countries, difficulty in proving a diagnosis of liver cancer due to the limited diagnostic facilities and the rapid course of the disease once diagnosed.

In the absence of adequate population based cancer registration and large long-standing prospective cohort of HIV positive patients on treatment, it is not surprising that non-AIDS defining malignancies have not been widely reported in Nigeria. Nevertheless there are case reports of cancers such as squamous cell carcinoma of the conjunctiva (SCC) and laryngeal cancer from different parts of the country.[30,35,43,44]

Challenges

The challenges encountered in the management of AIDS associated malignancies in Nigeria reflect the double burden of management of cancers in general and HIV/AIDS in a low resource

environment with weak public health infrastructure. These challenges range from stigma that prevents many patients from accessing HIV treatment and delaying presentation of cancer to weak and underfunded health care infrastructure. Prior to the advent of programs like PEPFAR, Global Fund and others, there was little health care available for PLWA in Nigeria. After several years of operations, these programs are still only able to provide ART to approximately 26% (95% CI 17% – 36%) of those who need it.[1] Since there is no similar international intervention for people with cancer, the proportion of cancer patients with access to treatment is significantly lower.

Despite massive public health education effort, large proportions of the Nigerian population still lack basic knowledge of HIV, its health effects and treatment options.[45] In contrast, there has been little investment in cancer education and awareness such that many more individuals are unaware of the prevalence, common symptoms, prevention and treatment of the common cancers[46]. This low level of education and lack of awareness extends to health care professionals whose training has led them to expect that cancer is not yet a major health problem in Nigeria.[47] It is therefore often not high on their list of differential diagnosis which leads to delayed diagnosis or misdiagnosis. Efforts to increase professional education on cancer, particularly the nexus with HIV/AIDS, in Nigeria, are being led by the Society of Oncology and Cancer Research of Nigeria – SOCRON -(<http://www.socron.net>) and the Nigeria Cancer Society in collaboration with international organizations like the American Society of Clinical Oncology (ASCO) and the International Agency for Cancer Research (IARC) but a lot more needs to be done.

Poverty, lack of education and conflicting theories about disease etiology are some of the causes of high rates of patronage of traditional and alternative medicine practitioners in Nigeria.[48, 49] This leads to high rates of late presentation of HIV and cancer.[32] More than 70% of all cancer patients in Nigeria present with advanced disease and there is no effective systematic cancer screening program in Nigeria.[50] Cervical cancer, an AIDS-defining cancer whose incidence in Nigeria remains very high, is the most amenable to early detection and treatment. [51,52*] Integration of cervical cancer screening into HIV care and prevention programs is an attractive and effective public health intervention in this category of patients.[52*] Visual Inspection with Acetic Acid (VIA) and same visit cryotherapy treatment (“See and treat”) has been effectively used in other low resource environments.[52*] Recent studies suggest that one time HPV screening is probably more effective for cervical cancer prevention in low resource countries.[53*,54] Other opportunities for cancer prevention such as evaluating behavioral risk, counseling and provision of health education at HIV prevention and treatment centers will also contribute to reduction of the incidence of cancer in PLWA.

The limited cancer registration in Nigeria has been highlighted. Investment in cancer registries in developing countries are not given the priority that it deserves by governments and international aids agencies.[8] There are limited opportunities for grants to support the development of cancer registries. The reasons for this include lack of appreciation of the value of cancer registration in the public health management of the cancer problem.[8] In 2009, in collaboration with Nigerian Federal Ministry of Health, the International Agency for Cancer Research, Lyon, France, the Institute of Human Virology, Nigeria; Society of Oncology and Cancer Research of Nigeria; CDC, Nigeria and the West African Bioethics Training Program in Nigeria, we conducted the first of what will be a series of training programs for cancer registries in Nigeria in order to improve cancer registration and lead to the resuscitation of the National Headquarters of Cancer Registries in Nigeria (<http://www.ihvnigeria.org/news.html#cancer09>).[55] The latter institution functioned briefly in the 1990s but has been moribund since then.[55] Linkage of cancer and HIV/AIDS registries will improve our ability to compute the incidence of cancers in PLWA.[42*,56]

Cancer case identification and diagnosis in the general population is poor due to lack of clinical skills, low numbers of oncology specialists and poor diagnostic oncology facilities. Case finding and diagnosis in HIV is much better than in oncology but in the setting of rapid scale-up of HIV services, emphasis has been on starting large number of individuals on treatment and only recently is the quality of care including cancer diagnosis coming into focus.[57] The reluctance of health care workers to fully examine and offer treatments to PLWA in Nigeria has been well documented and this needs to be tackled by HIV prevention and treatment providers.[45,58] Currently most cancer care in Nigeria is provided by non-specialists followed by specialists whose primary interest is not oncology. Avenues for providing in-country continuing education in cancer care should be vigorously pursued given that majority of Nigerian health care professional cannot attend out of town or out of country training or conferences. The American Society of Clinical Oncology (ASCO) is already collaborating with SOCRON to offer in-country training on multidisciplinary treatment of the common cancers in Nigeria taking cognizance of the predominant stage of presentation and limited local resources. (http://www.socron.net/socron_new/news_conference.html)

Treatment of cancers in Nigeria in general is hampered by lack of adequate treatment resources. There are few (less than 10) consistently functioning high quality radiotherapy centers in a country of 150 million people rendering this facility essentially inaccessible to majority of patients who need it. Drug treatment is expensive and the supply chain is plagued by the problems of poor supply chain management, fake and poor quality drugs whose prevalence was once estimated at about 80% in Nigeria.[59] Compounding the drug supply chain problem is the problem of poor adherence and lack of availability of some drugs.[60] Many patients adhere poorly to treatment because the regimes are costly, complicated and associated with high frequency and severity of side effects, particularly where adjuvant treatments that improves the tolerability of chemotherapy are either unavailable or unaffordable. New treatment programs that utilize lower doses, possibly over longer period of time (metronomic regimes) in order to reduce severity and frequency of treatment, alternative routes of drug administration such that frequency of dosing or need for highly qualified health professionals is reduced, shorter courses of treatments like radiotherapy so that more patients can be treated, reassessment of old treatment regimes such that efficacious, relatively lower cost, older treatments can be used, are all strategies that can be used in Nigerian patients.

Another major impediment to cancer care in PLWA is cost of treatment. Patients cannot afford treatment for either HIV or cancer. When both conditions occur together, the patients and their care providers end up in dire straits. Different intervention programs currently provide treatment for HIV/AIDS but these services often do not cover in-patient care and the treatment of malignancies associated with HIV/AIDS. Cancer treatment on the other hand continues to be an out-of-pocket expense for the majority of patients in Nigeria because, even though a National Health Insurance Scheme (NHIS - <http://www.nhis.gov.ng/benef.asp>) has existed in Nigeria for about a decade, it still does not provide coverage for cancer. As widespread treatment for HIV becomes established in Nigeria and more patients have been maintained on treatment for a long period of time, the major source of morbidity and mortality in them will be cancer because this has been the experience in other parts of the world.[39] It is therefore a scientific and an ethical imperative to include cancer prevention, diagnosis and treatment services in current HIV/AIDS treatment programs in order to stop PLWA from dying from cancer after they have been delivered from death due to HIV and associated infections.

Opportunities

The nexus between HIV/AIDS and malignancy presents several opportunities for prevention, treatment and research in Nigeria. Cancer prevention programs can be integrated into HIV/AIDS services in a seamless manner that takes advantage of the infrastructure that is already

in place for the management of HIV/AIDS and extends this to the provision of prevention, treatment and palliative care services for both categories of patients. HIV/AIDS associated prevention, health education, case finding, diagnostic and treatment facilities, adherence monitoring and training of health care professionals have seen large infusions of resources in the past few years, much more than any other single area of health care in Nigeria. The similarities between the management of cancers and HIV, the common risk factors for some cancers and HIV, and the co-occurrence of the two conditions presents opportunities for co-sharing of resources, research programs and lessons learned in a way that will substantially improve outcome for both diseases. Failure to recognize this at this point in time will add to the long list of missed opportunities that has plagued public health in Nigeria.

Conclusion

AIDS associated malignancies are poised to become the next epidemic and they will affect developing countries disproportionately. Programs that address this problem need to be put in place now so that the onslaught can be stemmed. Priority needs to be given to measures such as those designed to integrate cervical cancer prevention programs into HIV testing and screening program, extension of lessons learned in managing HIV/AIDS in resource poor environments to the management of cancers, co-sharing of resources, development of research programs to evaluate low cost, low tech treatment and prevention strategies, improving public and professional awareness and supporting the health system to deliver better health care to patients with cancer.

References

1. UNAIDS. , editor. UNAIDS. Report on the global HIV/AIDS epidemic 2008. Geneva: UNAIDS; 2008. Series Editor
2. Population pyramids for Nigeria on World Wide Web URL
<http://www.census.gov/cgi-bin/ipc/idbpyry.pl?cty=NI&maxp=12904386&maxa=100&ymax=300&yr=2007&.submit=Submit>
3. Blattner, W.; Dakum, P.; Osotimehin, B.; Nasidi, A.; Abimiku, A. Public Health Aspects of HIV/AIDS - Nigeria and West Africa. In: Celentano, DD.; Beyrer, C., editors. Public Health Aspects of HIV/AIDS in Low and Middle Income Countries. First. Springer; 2008. p. 217-251. * This is a comprehensive review of the state of the art of Public Health aspects of HIV/AIDS epidemic in Nigeria by the group offering care and support to the largest number of PLWA. The limited information on the incidence of cancer in this paper reflects the paucity of data on the subject
4. Bonnet F, Lewden C, May T, Heripet L, Jouglu E, Bevilacqua S, Costagliola D, Salmon D, Chene G, Morlat P. Malignancy-related causes of death in human immunodeficiency virus-infected patients in the era of highly active antiretroviral therapy. *Cancer* 2004;101:317–324. [PubMed: 15241829]
5. Goedert JJ, Cote TR, Virgo P, Scoppa SM, Kingma DW, Gail MH, Jaffe ES, Biggar RJ. Spectrum of AIDS-associated malignant disorders. *Lancet* 1998;352:1833–1839. [PubMed: 9652666]
6. Engels EA, Biggar RJ, Hall HI, Cross H, Crutchfield A, Finch JL, Grigg R, Hylton T, Pawlish KS, McNeel TS, et al. Cancer risk in people infected with human immunodeficiency virus in the United States. *Int J Cancer* 2008;123:187–194. [PubMed: 18435450]
7. Boyle, P.; Levin, B. World Cancer Report 2008. Geneva: International Agency for Research on Cancer; 2008.
8. Parkin, DM.; Ferlay, J.; Hamdi-Cherif, M.; Sitas, F.; Thomas, JO.; Wabinga, H.; Whelan, SL. Cancer in Africa: Epidemiology and Prevention. Lyon: IARC Press; 2003.
9. Clifford GM, Gallus S, Herrero R, Munoz N, Snijders PJ, Vaccarella S, Anh PT, Ferreccio C, Hieu NT, Matos E, et al. Worldwide distribution of human papillomavirus types in cytologically normal women in the International Agency for Research on Cancer HPV prevalence surveys: a pooled analysis. *Lancet* 2005;366:991–998. [PubMed: 16168781]

10. Franceschi S, Herrero R, Clifford GM, Snijders PJ, Arslan A, Anh PT, Bosch FX, Ferreccio C, Hieu NT, Lazcano-Ponce E, et al. Variations in the age-specific curves of human papillomavirus prevalence in women worldwide. *Int J Cancer* 2006;119:2677–2684. [PubMed: 16991121]
11. Heard I. Prevention of cervical cancer in women with HIV. *Curr Opin HIV AIDS* 2009;4:68–73. [PubMed: 19339941]
12. Vilarino-Varela M, Spittle MF. AIDS-related cancer. *Medicine* 2005;33:14–16.
13. Massad LS, Seaberg EC, Watts DH, Minkoff H, Levine AM, Henry D, Colie C, Darragh TM, Hessel NA. Long-term incidence of cervical cancer in women with human immunodeficiency virus. *Cancer* 2009;115:524–530. [PubMed: 19127538]
14. Palefsky J. Human papillomavirus-related disease in people with HIV. *Curr Opin HIV AIDS* 2009;4:52–56. [PubMed: 19339939]
15. Akinwuntan AL, Adesina OA, Okolo CA, Oluwasola OA, Oladokun A, Ifemeje AA, Adewole IF. Correlation of cervical cytology and visual inspection with acetic acid in HIV-positive women. *J Obstet Gynaecol* 2008;28:638–641. [PubMed: 19003664]
16. Mayun AA, Nggada HA, Audu BM, Pindiga UH, Khalil MI, Musa AB. Histopathological analysis of non-squamous cell malignancies of the uterine cervix in Maiduguri, Nigeria. *Afr J Med Med Sci* 2008;37:369–373. [PubMed: 19301715]
17. Mohammed AZ, Edino ST, Ochicha O, Gwarzo AK, Samaila AA. Cancer in Nigeria: a 10-year analysis of the Kano cancer registry. *Niger J Med* 2008;17:280–284. [PubMed: 18788253]
18. Udigwe GO, Ogabido CA. A clinico-pathological study of cervical carcinoma in South Eastern Nigeria; a five-year retrospective study. *Niger J Clin Pract* 2008;11:202–205. [PubMed: 19140354]
19. Adewuyi SA, Shittu SO, Rafindadi AH. Sociodemographic and clinicopathologic characterization of cervical cancers in northern Nigeria. *Eur J Gynaecol Oncol* 2008;29:61–64. [PubMed: 18386466]
20. Akujobi CN, Ikechebelu JI, Onunkwo I, Onyiaorah IV. Knowledge, attitude and practice of screening for cervical cancer among female students of a tertiary institution in South Eastern Nigeria. *Niger J Clin Pract* 2008;11:216–219. [PubMed: 19140357]
21. Anorlu RI. Cervical cancer: the sub-Saharan African perspective. *Reprod Health Matters* 2008;16:41–49. [PubMed: 19027621]
22. Goldie SJ, O'Shea M, Campos NG, Diaz M, Sweet S, Kim SY. Health and economic outcomes of HPV 16,18 vaccination in 72 GAVI-eligible countries. *Vaccine* 2008;26:4080–4093. [PubMed: 18550229]
23. Mueller JS, Schultenover S, Simpson J, Ely K, Netterville J. Value of rapid assessment cytology in the surgical management of head and neck tumors in a Nigerian mission hospital. *Head Neck* 2008;30:1083–1085. [PubMed: 18528905]
24. Obi SN, Ozumba BC. Cervical cancer: socioeconomic implications of management in a developing nation. *J Obstet Gynaecol* 2008;28:526–528. [PubMed: 18850430]
25. Ogunbowale T, Lawoyin TO. Cervical cancer risk factors and predictors of cervical dysplasia among women in south-west Nigeria. *Aust J Rural Health* 2008;16:338–342. [PubMed: 19032205]
26. Olusegun AK, Onwudiegwu U, Ogunniyi S, Loto O, Clement AA, Godwin OO. Trend in the presentation of cervical cancer in Nigeria. *Saudi Med J* 2008;29:1203–1204. [PubMed: 18690322]
27. Schnatz PF, Markelova NV, Holmes D, Mandavilli SR, O'Sullivan DM. The prevalence of cervical HPV and cytological abnormalities in association with reproductive factors of rural Nigerian women. *J Womens Health (Larchmt)* 2008;17:279–285. [PubMed: 18321179]
28. Mbah N, Abdulkareem IH, Panti A. AIDS-associated Kaposi's sarcoma in Sokoto, Nigeria. *Niger J Clin Pract* 2008;11:181–184. [PubMed: 19140350]
29. Asuquo ME, Ngim O, Ugare G, Omotoso J, Ebughe G. Major dermatologic malignancies encountered in a teaching hospital surgical department in South Nigeria. *Am J Clin Dermatol* 2008;9:383–387. [PubMed: 18973404]
30. Sanya EO, Adido J, Owosye JF, Ayanniyi AA, Buhari MO, Yusuf IF, Rahman GA. Conjunctival Kaposi's sarcoma in HIV-positive heterosexual Nigerian woman--a case report. *West Afr J Med* 2008;27:50–52. [PubMed: 18689306]
31. Kamei H, Koide T, Kojimam T, Hasegawa M, Terabe K, Umeda T, Hashimoto Y. Flavonoid-mediated tumor growth suppression demonstrated by in vivo study. *Cancer Biother Radiopharm* 1996;11:193–196. [PubMed: 10851537]

32. Oji C, Chukwuneke F. Clinical evaluation of Kaposi Sarcoma in HIV/AIDS patients with Orofacial Lesions. *J Oral Maxillofac Surg* 2008;66:1362–1365. [PubMed: 18571017]
33. Adelusola KA, Sabageh DO, Ukah CO. Lymphoreticular diseases in Nigerians. *Afr Health Sci* 2008;8:20–24. [PubMed: 19357728]
34. Adeyemi BF, Adegunle LV, Kolude BM, Akang EE, Lawoyin JO. Head and neck cancer--a clinicopathological study in a tertiary care center. *J Natl Med Assoc* 2008;100:690–697. [PubMed: 18595571]
35. Chuka-Okosa CM, Uche NJ, Kizor-Akaraiwe NN. Orbito-ocular neoplasms in Enugu, South-Eastern, Nigeria. *West Afr J Med* 2008;27:144–147. [PubMed: 19256317]
36. Fadiora SO, Mabayoje VO, Oboro VO, Ojemakinde KA, Bello TO, Adeniji AA. Ovarian non-Hodgkin's lymphoma presenting as obstructive jaundice - a case report. *Niger Postgrad Med J* 2008;15:267–269. [PubMed: 19169347]
37. Ocheni S, Bioha FI, Ibegbulam OG, Emodi IJ, Ikefuna AN. Changing pattern of childhood malignancies in Eastern Nigeria. *West Afr J Med* 2008;27:3–6. [PubMed: 18689295]
38. Omoregie FO, Saheeb BD, Onasanya PO. Periradicular burkitt's lymphoma: a report of 2 cases from Nigeria and review of the literature. *Afr J Med Med Sci* 2008;37:279–283. [PubMed: 18982822]
39. Powles T, Oliver T, Bower M. Non-AIDS-defining cancers in people with HIV infection: a sleeping giant? *J HIV Ther* 2006;11:57–60. [PubMed: 17580500]
40. Bonnet F, Chene G. Evolving epidemiology of malignancies in HIV. *Curr Opin Oncol* 2008;20:534–540. [PubMed: 19106656]
41. Mitsuyasu RT. Non--AIDS-defining malignancies in HIV. *Top HIV Med* 2008;16:117–121. [PubMed: 18838745]
42. Dal Maso L, Polesel J, Serraino D, Lise M, Piselli P, Falcini F, Russo A, Intrieri T, Vercelli M, Zambon P, et al. Pattern of cancer risk in persons with AIDS in Italy in the HAART era. *Br J Cancer* 2009;100:840–847. [PubMed: 19223894] * This paper demonstrates the value of AIDS - Cancer Registry Matching studies which are needed to understand the incidence of AIDS associated cancers in Nigeria.
43. Nwosu NN. HIV/AIDS in ophthalmic patients: The Guinness Eye Centre Onitsha experience. *Niger Postgrad Med J* 2008;15:24–27. [PubMed: 18408779]
44. Osahon AI, Onunu AN. Ocular disorders in patients infected with the human immunodeficiency virus at the University of Benin Teaching Hospital, Benin City, Nigeria. *Niger J Clin Pract* 2007;10:283–286. [PubMed: 18293635]
45. Reis C, Heisler M, Amowitz LL, Moreland RS, Mafeni JO, Anyamele C, Iacopino V. Discriminatory attitudes and practices by health workers toward patients with HIV/AIDS in Nigeria. *PLoS Med* 2005;2:e246. [PubMed: 16022564]
46. Okobia MN, Bunker CH, Okonofua FE, Osime U. Knowledge, attitude and practice of Nigerian women towards breast cancer: a cross-sectional study. *World J Surg Oncol* 2006;4:11. [PubMed: 16504034]
47. Ibrahim NA, Odusanya OO. Knowledge of risk factors, beliefs and practices of female healthcare professionals towards breast cancer in a tertiary institution in Lagos, Nigeria. *BMC Cancer* 2009;9:76. [PubMed: 19261179]
48. Ezeome ER, Anarado AN. Use of complementary and alternative medicine by cancer patients at the University of Nigeria Teaching Hospital, Enugu, Nigeria. *BMC Complement Altern Med* 2007;7:28. [PubMed: 17850665]
49. Mills E, Singh S, Wilson K, Peters E, Onia R, Kanfer I. The challenges of involving traditional healers in HIV/AIDS care. *Int J STD AIDS* 2006;17:360–363. [PubMed: 16734953]
50. Adebamowo CA, Ajayi OO. Breast cancer in Nigeria. *West Afr J Med* 2000;19:179–191. [PubMed: 11126081]
51. Anorlu RI, Orakwue CO, Oyeneyin L, Abudu OO. Late presentation of patients with cervical cancer to a tertiary hospital in Lagos: what is responsible? *Eur J Gynaecol Oncol* 2004;25:729–732. [PubMed: 15597852]
52. Mwanahamuntu MH, Sahasrabudde VV, Stringer JSA, Parham P. Integrating cervical cancer prevention in HIV/AIDS treatment and care programmes. *Bulletin of the WHO* 2008;86:D–E. * This is an important commentary that illustrates the opportunities existing for integration of cancer

prevention services into HIV/AIDS treatment and care programs from a group that has successfully implemented this at several locations in Africa.

53. Sankaranarayanan R, Nene BM, Shastri SS, Jayant K, Muwonge R, Budukh AM, Hingmire S, Malvi SG, Thorat R, Kothari A, et al. HPV Screening for Cervical Cancer in Rural India. *New Engl J Med* 2009;360:1385–1394. [PubMed: 19339719] * This is a landmark study that may well change the way that cervical cancer prevention programs are conducted in future.
54. Schiffman M, Wacholder S. From India to the World - A better way to prevent Cervical Cancer. *New Engl J Med* 2009;360:1453–1455. [PubMed: 19339726]
55. Solanke, TF.; Adebamowo, CA. Report of the Workshop on the State of the Art in Oncology in Ibadan and Ife. Ibadan: National Headquarters of Cancer Registries in Nigeria; 1998.
56. Mbulaiteye SM, Katabira ET, Wabinga H, Parkin DM, Virgo P, Ochai R, Workneh M, Coutinho A, Engels EA. Spectrum of cancers among HIV-infected persons in Africa: the Uganda AIDS-Cancer Registry Match Study. *Int J Cancer* 2006;118:985–990. [PubMed: 16106415]
57. Assefa Y, Jerene D, Lulseged S, Ooms G, Van Damme W. Rapid scale-up of antiretroviral treatment in Ethiopia: successes and system-wide effects. *PLoS Med* 2009;6:e1000056. [PubMed: 19399154]
58. Adebamowo CA, Ezeome ER, Ajuwon JA, Ogundiran TO. Survey of the knowledge, attitude and practice of Nigerian surgery trainees to HIV-infected persons and AIDS patients. *BMC Surg* 2002;2:7. [PubMed: 12201903]
59. Cockburn R, Newton PN, Agyarko EK, Akunyuli D, White NJ. The global threat of counterfeit drugs: Why industry and governments must communicate the dangers. *PLoS Med* 2005;2:e100. [PubMed: 15755195]
60. Emoti CE, Enosolease ME. The effect of accessibility to drugs on outcome of therapy in patients with malignant lymphoma. *Niger Postgrad Med J* 2008;15:10–14. [PubMed: 18408776]

Curr Opin Oncol. Author manuscript; available in PMC 2010 May 5.