

FACTORS ASSOCIATED WITH HIV INFECTION AMONG CLIENTS ACCESSING HIV COUNSELING AND TESTING SERVICES IN A SECONDARY REFERRAL HOSPITAL IN LAGOS, NIGERIA

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Abstract

Background: HIV counselling and testing (HCT) provides an opportunity for people to learn more about the human immune deficiency virus (HIV). This study assessed the knowledge of, and factors associated with, HIV infections among clients assessing HCT services referral hospital in Lagos, Nigeria.

Materials and Methods: Retrospective review of records of clients who assessed HCT services at Mainland Hospital Lagos, Nigeria, between July 1, 2016, and December 31, 2017, was done. Multivariate analysis was done to identify the factors associated with HIV infection and knowledge of HIV.

Results: A total of 4273 clients were screened for HIV within the study period. The mean age of clients was 38.5±14.4. Male:Female ratio was 1:0.87. The prevalence of HIV infection was 19%. Factors associated with HIV infection were: age above 24 years, being female (AOR 1.6 95% CI 1.4–2.0, p<0.001), previous marriage (divorced, widowed, separated) (AOR 2.3 95% CI 1.7– 3.3, p<0.001) and poor knowledge of HIV (AOR 2.9 95% CI 2.2–3.6, p<0.001). Males were 15 times more likely to have good knowledge of HIV than females (AOR 14.5 95% CI 10.5– 20.0, p<0.001). In addition, the clients who were single (AOR 3.6 95% CI 2.4–5.4, p<0.001) and married (AOR 3.9 95% CI 2.9–5.3, p<0.001) were four times more likely to have good knowledge of HIV than clients who were previously married.

Conclusion: More proactive measures are required to educate the public, especially women who were previously married, on HIV transmission and prevention.

Key Words: Clients, HIV, HIV counselling and testing, Knowledge of HIV, Lagos, Nigeria.

List of abbreviations: AIDS – Acquired Immune deficiency syndrome, AOR – Adjusted odds ratio, ARV – Anti-retroviral drugs, CI – Confidence interval, COR – Crude odds ratio, FHI 360 – Family Health International, HCT – HIV counselling and testing, HIV – Human immune deficiency virus, MDR-TB- Multi-drug resistant Tuberculosis, MSM – Men sleeping with men, p – p value, PLWHA- People living with HIV/AIDS, SPSS – Statistical Package for Social Sciences, STI – Sexually transmitted infection, TB – Tuberculosis, FMOH- Federal Ministry of Health, NACA - Nigeria National Agency for the Control of AIDS UNICEF- United Nations Children's Fund, NPC - Nigeria Population Commission, UNAIDS- The Joint United Nations Programme on HIV and AIDS

Introduction

HIV Counselling and Testing (HCT) is the first step to HIV management and other support services. It allows clients the opportunity to know their HIV status and get to know more about the human immune deficiency virus (HIV). It enhances and provides

the needed change in behaviour, psychological and emotional support to people living with HIV/AIDS (PLWHA). HCT also foster social integration and reduces the stigma associated with HIV in the community (FMOH, 2011).

The Nigerian government aimed to provide HIV counselling for at least 80% (about 80 million) of the sexually active population by 2015 through the provision of physical access to HIV related services. However, the demand for HCT in the country was very low despite the adoption of the client and the provider-initiated counselling and testing approaches (FMOH, 2011; UNAIDS, 2016). The inadequate availability of HIV testing kits, wrong perception of the end-users about HCT centers, and the inadequate number of facilities providing HCT services are reasons for low uptake of HCT in Nigeria (NACA, 2010a).

The Nigeria National Agency for the Control of AIDS reported that the number of HCT sites was low (34%) compared to the number required to provide effective coverage in the country (NACA, 2010b).

HIV remains a public health issue in Nigeria, despite the reduction in its prevalence in the last decade. Although the prevalence of HIV among adult is low (3.4%), but in actual numbers, the country has the second-largest HIV epidemic globally after South Africa, based on the population (UNAIDS, 2016). Heterosexual intercourse accounts for 80% of HIV infection in the country but transmission through intravenous drug use and same-sex intercourse are increasing in Nigeria and could contribute to 40% of new infections (NACA, 2015). There is, therefore, a need to create more awareness and intensify efforts aimed at increasing the knowledge of Nigerians of HIV. Age, gender, educational status, marital status and knowledge of HIV have been associated with HIV infection among HCT clients (Zheng et al, 2010; Peltzer, 2012).

A survey reported that the general awareness of HIV in Nigeria is high (FMOH, 2013), however, the comprehensive knowledge of HIV prevention is poor (34% and 24% among men and women, respectively) which is lower than the West and Central Africa rate (UNICEF, 2011). The comprehensive knowledge of HIV prevention was associated with educational and socio-economic status (UNICEF, 2011). To the best of the authors' knowledge, few studies have assessed the knowledge of clients accessing HCT services in Nigeria. This study assessed the knowledge and factors associated with HIV infection among clients undertaking HCT services in a secondary referral hospital in Lagos, Nigeria.

Materials and Methods

Study design

A cross-sectional study was conducted by reviewing records of clients who assessed HCT services at Mainland Hospital Lagos, Nigeria, between July 1, 2016, and December 31, 2017, was conducted.

Study background HIV counselling and testing in Lagos, Nigeria

The study location was Mainland Hospital Lagos, Nigeria, a secondary referral hospital for treatment of infectious diseases like tuberculosis (TB), HIV/AIDS, multi-drug resistant TB MDR-TB), Cholera, Ebola virus disease and Lassa fever in Lagos state Nigeria. HIV treatment in the hospital commenced in 2000, supported by Family Health International (FHI 360). HIV test, laboratory test (CD 4 count and viral load) and antiretroviral drugs (ARVs) were at no cost to the patients. About 12,000 clients had been enrolled for ARVs in the hospital as at the end of 2017.

HCT was integrated into the services offered at Mainland hospital and as such, it was offered to all patients assessing services at the hospital by trained counsellors according to the National guidelines for HIV counselling and testing (FMOH, 2011). HCT involves pre-test counselling in which basic facts of HIV/AIDS are provided, HIV rapid test and the meaning of the results were explained. Also, HIV risk behaviours, risk reduction strategies and available support systems were explored. Issues relating to disclosure and informed consent before conducting HIV test were also discussed (FMOH, 2011). Post-test counselling (offered to all clients regardless of the HIV test outcome) involves: discussion of HIV results and highlighting the window period for HIV negative clients, risk reduction plan review, discussion on positive living for HIV positive clients, disclosure of status to spouse and counsel for a partner to do HIV test.

Adherence counselling was offered to all HIV positive clients before anti-retroviral drugs initiation. They were also referred for other supportive services such as treatment of opportunistic infections, sexually transmitted infections (STIs) and TB management, prevention of mother-to-child transmission, family planning, nutrition and psychological support as the case may be (FMOH, 2011). Findings from the pre- and post-test counselling in addition to the clients' details were entered into the HCT client intake form. The HCT client intake form is a harmonized tool designed by the Federal Government of Nigeria in partnership by implementing partners to capture details of pre- and post-test counselling findings of clients seeking HCT services.

HIV was diagnosed using HIV rapid test kits. No further test was carried out if the result was negative, however, in a positive test, confirmation was done with Uni-Gold rapid kit. A concordance result was regarded as positive, otherwise, STAT-PAK® was used as a tie-breaker.

Inclusion and exclusion criteria: All available records of patients that accessed HCT services during the period under review were included for analysis. Others were excluded.

Evaluation of knowledge of HIV infection

Clients' knowledge of HIV infection was assessed based on 6 sets of questions relating to knowledge of clients about HIV transmission routes, risk factors for HIV transmission, prevention of HIV transmission methods, the possible outcome of HIV test and previous HIV test on the client intake form. A correct answer was scored one mark while a wrong answer was score zero. The mean score of the study population was used as the cutoff. Clients with scores above the average score were classified as having good knowledge of HIV, while clients with scores below the sample average score of the population were classified as having poor knowledge of HIV.

Data analysis

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) IBM version 22. Numerical variables were represented by percentages, mean and standard deviation. Knowledge of HIV and HIV status were the outcome variables. Categorical variables were compared using the chi-squared test. Multivariate analysis was done to identify the correlates of HIV infection and knowledge of HIV. For all statistical tests $p < 0.05$ was considered statistically significant.

Ethical considerations

The Health Research and Ethical Committee of the Lagos State University Teaching Hospital granted the ethical approval (Reg. No. NHREC04/04/2008, approved on 31/07/2018) for the study. Also, written permission to use data was obtained from the Management of Mainland Hospital, Lagos. Clients' confidentiality was maintained by de-identifying the data before data entry and analysis.

Results

A total of 4,273 clients were screened for HIV within the study period. Of these, 38.1% and 61.9% were screened in 2016 and 2017, respectively. The mean age of clients was 38.5 ± 14.4 . Males were more than females except for the clients below 25 years. About 33%, 59% and 8% of the clients were single, married and previously married, respectively, as shown in Table 1. The association between knowledge of HIV and HIV infection is shown in Table 2. The HIV prevalence within the study period was 19%. HIV prevalence was higher among clients who were not previously tested (22.5%) and they had 2-fold chance of being HIV positive, compared to clients who had HIV test previously (18.3%) (AOR 2.1, 95% CI 1.7–2.6, $p < 0.001$). There was 30% chance of clients not informed of HIV transmission routes to be HIV positive compared with clients informed of HIV transmission routes (AOR 1.3, 95% CI 1.0–1.7, $p = 0.040$). Clients not informed about HIV transmission methods had 7-fold chance of having HIV infection than clients who knew about the methods of preventing HIV transmission (AOR 6.8, 95% CI 1.5–30.8, $p = 0.013$).

The socio-demographic factors associated with HIV infection is shown in Table 3. The odds of having HIV infection was 3-fold higher (AOR 3.1 95% CI 2.1–4.5, $p < 0.001$) among clients 25–34 years, 5-fold higher (AOR 5.3 85% CI 3.6–7.9, $p < 0.001$) among clients 35–44 years, 5-fold more (AOR 4.9 95% CI 3.2–7.4, $P < 0.001$) among clients 45–54 years and 2-fold higher (AOR 2.0 95% CI 1.2–3.3, $p = 0.006$) among clients 55–64 years than clients less than 25 years. Females had a 60% chance of having HIV than males (AOR 1.6 95% CI 1.4–2.0, $p < 0.001$). Clients who were previously married (divorced, widowed, separated) had 130% chance of having HIV than clients who were single (AOR 2.3 95% CI 1.7–3.3, $p < 0.001$). The likelihood of HIV infection was about 3-fold more among clients who had poor knowledge of HIV than clients who had good knowledge of HIV (AOR 2.9 95% CI 2.2–3.6, $p < 0.001$).

Males are about 15 times more likely to have good knowledge of HIV than females (AOR 14.5 95% CI 10.5–20.0, $p < 0.001$). Also, clients who were single (AOR 3.6 95% CI 2.4–5.4, $p < 0.001$) and married (AOR 3.9 95% CI 2.9–5.3, $p < 0.001$) were four times more likely to have good knowledge of HIV than clients who were previously married as shown in Table 4.

Table 1: Socio demographic distribution by age-group.

Variables	Age groups (years)						Total n=4273 (%)
	< 25 n= 673 (%)	25 – 34 n = 1148 (%)	35 – 44 n = 1110 (%)	45 – 54 n = 730 (%)	55 – 64 n = 373 (%)	>64 n = 239 (%)	
Gender							
Male	312 (46.4)	593 (51.7)	597 (53.8)	430 (58.9)	210 (56.3)	134 (65.1)	2276 (53.3)
Female	361 (53.6)	555 (48.3)	513 (46.2)	300 (41.1)	163 (43.7)	105 (43.9)	1997 (46.7)
Marital Status							
Single	640 (95.1)	566 (49.3)	173 (15.6)	27 (3.7)	7 (1.9)	3 (1.3)	1416 (33.1)
Married	33 (4.9)	555 (48.3)	799 (72.0)	615 (84.2)	324 (86.9)	205 (85.8)	2531 (59.2)
Previously married [#]	0 (0.0)	27 (2.4)	138 (12.4)	88 (12.1)	42 (11.3)	31 (13.0)	326 (7.6)
Year							
2016	252 (37.4)	458 (39.9)	406 (36.6)	282 (38.6)	129 (34.6)	99 (41.4)	1626 (38.1)
2017	421 (62.6)	690 (60.1)	704 (63.4)	448 (61.4)	244 (65.4)	140 (58.6)	2647 (61.9)

NB: # = Widow, widower, divorced, separated

Table 2: Association between knowledge of clients attending HCT and HIV test outcome

Variables	HIV Positive n = 811 (%)	HIV Negative n = 3462 (%)	COR (95%CI), p	AOR (95%CI), p
Previous testing				
Yes	652 (18.3)	2914 (81.7)	1	
No	159 (22.5)	548 (77.5)	1.3 (1.1 – 1.6), 0.009	2.1 (1.7 – 2.6), <0.001
Has knowledge of HIV Routes of transmission				
Yes	611 (75.3)	3160 (91.3)	1	
No	200 (24.7)	302 (8.7)	3.4 (2.8 – 4.2), <0.001	1.3 (1.0 – 1.7), 0.040
Informed about risk factors of HIV transmission				
Yes	455 (56.1)	2857 (82.5)	1	
No	356 (43.9)	605 (17.5)	3.7 (3.1 – 4.4), <0.001	0.6 (0.1 – 2.6), 0.57
Informed about preventing HIV transmission methods				
Yes	452 (13.7)	2858 (86.3)	1	
No	359 (37.3)	604 (67.2)	3.8 (3.2 - 4.4), <0.001	6.8 (1.5 – 30.8), 0.013

NB: COR = crude Odds ratio, AOR = Adjusted odds ratio, CI = Confidence interval, p = p value, HCT = HIV counselling and testing

Table 3: Socio demographic factors associated with HIV infection

Variables	HIV positive n = 811 (%)	HIV negative n = 3462 (%)	COR (95%CI), p	AOR (95%CI), p
Age group (years)				
< 25	42 (6.2)	631 (93.8)	1	1
25 – 34	200 (17.4)	948 (82.6)	3.2 (2.2 – 4.6), <0.001	3.1 (2.1–4.5), <0.001
35 – 44	311 (28.0)	799 (72.0)	5.9 (4.1 – 8.3), <0.001	5.3 (3.6 – 7.9), <0.001
45 – 54	191 (26.2)	539 (73.8)	5.3 (3.7 – 7.7), <0.001	4.9 (3.2 – 7.4), <0.001
55 – 64	50 (13.4)	323 (86.6)	2.3 (1.5 – 3.7), <0.001	2.0 (1.2 – 3.3), 0.006
≥ 65	17 (7.1)	222 (92.9)	1.2 (0.6 – 2.3), 0.6376	0.9 (0.5 – 1.7), 0.904
Gender				
Male	323 (14.2)	1953 (85.8)	1	1
Female	88 (24.4)	1509 (75.6)	2.0 (1.7 – 2.3), <0.001	1.6 (1.4 – 2.0), <0.001
Marital Status				
Single	170 (12.0)	2146 (88.0)	1	1
Currently Married	513 (20.3)	2018 (79.7)	3.2 (2.7 – 3.9), <0.001	1.1 (0.9 – 1.4), 0.306
Previously Married	128 (39.3)	198 (60.7)	8.2 (6.2 – 10.8), <0.001	2.3 (1.7 – 3.3), <0.001
Knowledge of HIV				
Good	612 (16.2)	3173 (83.8)	1	1
Poor	199 (40.8)	289 (59.2)	3.6 (2.9 – 4.4), <0.001	2.9 (2.2 – 3.6), <0.001

NB: COR = crude Odds ratio, AOR = Adjusted odds ratio, CI = Confidence interval, p = p value

Table 4: Characteristics of clients with good knowledge of HIV

Variables	Knowledge of HIV		COR (95%CI), p	AOR (95%CI), p
	Good n = 3785 (%)	Poor n = 488 (%)		
Age group (years)				
< 25	594 (88.3)	79 (11.7)	1	
25 – 34	1013 (88.2)	135 (11.8)	1.0 (0.7 – 1.3), 0.9892	0.9 (0.6 – 1.3), 0.553
35 – 44	988 (89.0)	122 (11.0)	1.1 (0.8 – 1.5), 0.6285	1.1 (0.7 – 1.7), 0.607
45 – 54	647 (88.6)	83 (11.4)	1.0 (0.7 – 1.4), 0.8291	0.9 (0.6 – 1.5), 0.766
55 – 64	333 (89.3)	40 (10.7)	1.1 (0.7 – 1.7), 0.6205	1.1 (0.6 – 1.8), 0.843
>65	210 (87.9)	29 (12.1)	1.5 (0.9 – 2.3), 0.1085	1.0 (0.5 – 1.7), 0.906
Gender				
Female	1554 (77.8)	443 (22.2)	1	
Male	2231 (98.0)	45 (2.0)	14.1 (10.3 – 19.3), <0.001	14.5 (10.5 – 20.0), <0.001
Marital Status				
Single	1273 (89.9)	143 (10.1)	3.4 (2.5 – 4.6), <0.001	3.6 (2.4 – 5.4), <0.001
Married	2276 (89.9)	255 (10.1)	3.4 (2.6 – 4.5), <0.001	3.9 (2.9 – 5.3), <0.001
Ever Married	236 (72.4)	90 (27.6)	1	

NB: COR = crude Odds ratio, AOR = Adjusted odds ratio, CI = Confidence interval, p = p value.

Discussion

HCT provides a unique opportunity for early detection and prompt initiation of treatment of HIV patients, regardless of their CD4 count (FMOH, 2016). In this study, 19% of clients that assessed the HCT services within the study period had HIV infection. This prevalence is higher than the 3.4% obtained from national surveys (NACA, 2015; FMOH, 2013). Although an earlier study conducted at the hospital estimated the TB/HIV co-infection rate to be 21.6% (Adejumo et al, 2017). The study site being, a referral hospital for HIV, TB and MDR-TB in Lagos State, may explain the high prevalence of HIV obtained in our study.

The odds of having HIV infection in this study was higher among the older age groups compared with clients less than 24 years. Clients aged 35–44 years had the highest prevalence of HIV in this study. This is similar to the finding of the national HIV survey in Nigeria, in which the highest prevalence of HIV was among the age group 35–39 years (FMOH, 2013). Studies from South Africa and China reported similar findings (Peltzer, 2012; Zheng et al, 2010).

Similar to the findings from Nigeria and South Africa, the prevalence of HIV was higher in females than in males, and females had 60% chance of having HIV compare with males in this study (NACA 2010b; FMOH 2013; Awofala et al, 2018; Rehle et al, 2010; UNAIDS, 2014). Heterogeneous sex remains the major route of HIV transmission in Nigeria, accounting for 80% of infection (NACA 2010b; NACA, 2015). There is an increase in the prevalence of HIV among men sleeping with men (MSM) in Nigeria, female sex workers and intravenous drug users (FMOH 2010 a,b). Studies from South Africa and Kenya showed that the odds of having HIV was three times higher among MSM than men who had sex with women only, and significantly higher proportion of females are HIV infected than males of the same age group. (Dunkle et al, 2013; Sanders et al, 2013). They also acquire the infection 5-7 years earlier than their male peers (Ayesha and Quarraisha, 2016). Poverty, earlier sexual debut among females, child marriage, transactional sex, multiple partners, gender-based violence, low condom use and sexually transmitted infections contribute to women vulnerabilities to HIV (NACA, 2014; Zuma et al, 2010; Peltzer, 2010; Halperin et al, 2011).

Compare to single clients, previously married clients (widow, separated or divorced) had over two-fold chance to have HIV in this study. A similar observation has been reported in a national survey in Nigeria (FHOM, 2013). They may be infected by their spouses who later died or the discovery of the status of their spouses led to either separation or divorce. Recent large population surveys in sub-Saharan Africa have documented that widows and divorced women are likely to engage in high-risk behaviours for sustenance (Patel et al, 2018; Tenkorang, 2014).

Our study showed that a majority (88.6%) had good knowledge of HIV transmission and prevention, similar to what was obtained in the 2013 National demographic Health survey (NPC, 2013). On the contrary, other studies from Nigeria, Congo, Ethiopia, Bolivia and India showed knowledge of HIV to be poor (UNICEF, 2011; NPC, 2013; Gebremedhin et al, 2017; Oljira et al, 2013; Teran et al, 2015). HCT provides an opportunity for people to learn more about HIV (FMOH, 2011). In this study, the prevalence of clients who had no previous HIV test were twice likely to have HIV infection, compared with clients who were tested previously. The knowledge of HIV transmission acquired during previous HCT session may be responsible for this finding. People who had undergone HCT have been found to have greater knowledge scores than those who have not had HCT (Mall et al, 2013). The association between knowledge of HIV and HIV infection has been found to be inconsistent from several reports in different parts of the world. While some authors have documented having good knowledge of HIV does not translate to positive behavioural change and low HIV prevalence (Fagbamigbe et al, 2017; Gobopamang, 2011), others documented that poor knowledge of HIV transmission routes to be a risk factor for HIV infection (Hong et al, 2012). In the present study, the odds of HIV infection was higher among clients not informed of the routes of HIV transmission, prevention of HIV transmission and clients with poor knowledge of HIV. Knowledge of HIV was not associated with age. However, males had better knowledge than females in this study, as documented in many other studies from Nigeria and South Africa (Peltzer, 2012; UNICEF, 2011; NPC, 2013).

Conclusion

The prevalence of HIV in this study was higher than the national figures. Age, gender, marital status, previous HCT and knowledge of HIV were factors associated with HIV infection in this study. Although the prevalence of HIV is reducing in Nigeria, “there is need to sustain efforts at reducing the prevalence of HIV among women, especially widows.”

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Declaration on Conflict of Interest

The authors declare that there is no conflict of interest associated with this study.

References

1. Adejumo, A.O., Daniel, O.J., Otesanya, A.F., Adegbola, A.A., Femi-Adebayo, T. Bowale, A., Adesola, S., Kuku, O., Otemuyiwa, K.O., Oladega, S.N., Johnson, E.O., Falana, A.A., Dawodu, O., Owuna, H., Osoba, G. and Dacosta, A. (2017). Factors associated with TB/HIV co-infection among drug sensitive tuberculosis patients managed in a secondary health facility in Lagos, Nigeria. *Africa Journal of Infectious Diseases*, 11: 75-82.
2. Awofala, A.A. and Ogundele, O.E. (2018). HIV epidemiology in Nigeria. *Saudi Journal of Biological Sciences*, 25: 697–703.

3. Ayesha, B.M.K. and Quarraisha, A.K. (2016). HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. *The Open AIDS Journal*, 10:34-48.
4. Dunkle, K.L., Jewkes, R.K., Murdock, D.W., Sikweyiya, Y. and Morrell, R. (2013). Prevalence of consensual male-male sex and sexual violence, and associations with HIV in South Africa: a population based cross sectional study. *PLoS Medicine*, <http://dx.doi.org/10.1371/journal.pmed.1001472>.
5. Fagbamigbe, A.F., Lawal, A.M. and Idemudia, E.S. (2017). Modelling self-assessed vulnerability to HIV and its associated factors in a HIV-burdened country, SAHARA-J: *Journal of Social Aspects of HIV/AIDS*, 14:140-152.
6. Federal Ministry of Health (FMOH) Nigeria. (2010a). HIV Integrated Biological and Behavioural Surveillance Survey, 2010.
7. Federal Ministry of Health (FMOH) Nigeria. (2010b). National HIV Sero-prevalence Sentinel Survey Among Pregnant Women Attending Antenatal Clinics in Nigeria. https://nigeriahealthwatch.com/wp-content/uploads/bsk-pdf-manager/1176_2014_National_HIV_Sero-prevalence_Sentinel_Survey_among_Pregnant_Women_Attending_Antenatal_Clinics_in_Nigeria_FMOH_1229.pdf (accessed February 2018).
8. Federal Ministry of Health (FMOH) Nigeria. (2011). National Guidelines for HIV Counselling and Testing. FMOH Abuja. https://aidsfree.usaid.gov/sites/default/files/hts_policy_nigeria.pdf (accessed April 2018).
9. Federal Ministry of Health (FMOH) Nigeria. (2013). National HIV & AIDS and Reproductive Health Survey 2012. NARHS Plus II. <http://naca.gov.ng/wordpress/wp-content/uploads/2016/11/NARHS-Plus-2012-Final-18112013.pdf> (accessed May 2018)
10. Federal Ministry of Health (2016). Abuja Nigeria. National Guidelines for HIV prevention treatment and Care. <http://apps.who.int/medicinedocs/documents/s23252en/s23252en.pdf> (accessed March 2018).
11. Gebremedhin, S.A., Youjie, W. and Tesfamariam, E.H. (2017). Predictors of HIV/AIDS Knowledge and Attitude among Young Women of Nigeria and Democratic Republic of Congo: Cross-Sectional Study. *Journal of AIDS Clinical Research*, 8: 677. doi: 10.4172/2155-6113.1000677.
12. Gobopamang, L. (2011). Does correct knowledge about HIV and AIDS lead to safer sexual behaviour? The case of young people in Botswana. *African Population Studies*, 25: 1. DOI: <http://dx.doi.org/10.11564/25-1-266>.
13. Halperin, D.T., Mugurungi, O., Hallett, T.B., Muchini, B., Campbell, B., Magure, T., Benedikt, C. and Gregson, S. (2011). A surprising prevention success: why did the HIV epidemic decline in Zimbabwe? *PLoS Medicine*, 8(2). <http://dx.doi.org/10.1371/journal.pmed.1000414> (accessed May 2018).
14. Hong, S.Y., Thompson, D., Wanke, C., Omosa, G., Jordan, M.R., Tang, A.M., Patta, S., Mwero, B., Mjomba, I. and Mwamburi, M. (2012). Knowledge of HIV Transmission and Associated Factors among HIV-Positive and HIV-Negative Patients in Rural Kenya. *Journal of AIDS and Clinical Research*, 3:170. doi:10.4172/2155-6113.1000170.
15. Mall, S., Middelkoop, K., Mark, D., Wood, R. and Bekker, L. (2013). Changing Patterns in HIV/AIDS Stigma and Uptake of Voluntary Counselling and Testing Services: The Results of Two Consecutive Community Surveys Conducted in the Western Cape, South Africa *AIDS Care*, 25:194-201.
16. Nigeria National Agency for the Control of AIDS (2010a). End of term desk review report of the 2010-2015 National HIV/AIDS strategic plan, 2015. <https://www.medbox.org/nigeria-end-of-term-desk-review-report-of-the-2010-2015-national-hiv-aids-strategic-plan/preview?q=> (accessed April 2018).
17. Nigeria National Agency for the Control of AIDS (2010b). United Nations General Assembly Special Session (UNGASS) Country Progress Report. Nigeria: January 2008 to December 2009. http://data.unaids.org/pub/Report/2010/nigeria_2010_country_progress_report_en.pdf (accessed May 2018).
18. Nigeria National Agency for the Control of AIDS (2014). Nigeria. Nigeria National Agency for the Control of AIDS Global AIDS Response Country Progress Report Nigeria GARPR 2014. http://www.unaids.org/sites/default/files/country/documents/NGA_narrative_report_2014.pdf (accessed May 2018).
19. Nigeria National Agency for control of AIDS (2015). Nigeria. Global AIDS Response. Country Progress report. Nigeria GARPR 2015. http://www.unaids.org/sites/default/files/country/documents/NGA_narrative_report_2015.pdf (accessed May 2018).
20. Nigeria Population Commission (2013). National Demographic health survey 2013. <https://dhsprogram.com/pubs/pdf/fr293/fr293.pdf> (accessed May 2018).
21. Oljira, L., Berhane, Y. and Worku, A. (2013). Assessment of comprehensive HIV/AIDS knowledge level among in-school adolescents in eastern Ethiopia. *Journal of the International AIDS Society*, 16:17437 doi:10.7448/IAS.16.1.17349.
22. Patel, C.J., Bhattacharya, J., Ioannidis, J.P.A. and Bendavid, E. (2018). Systematic identification of correlates of HIV infection: an X-wide association study. *AIDS*, 32:933-943.
23. Peltzer, K. (2010). Early sexual debut and associated factors among in school adolescents in eight African countries. *Acta Paediatrica*, 99:1242-1247.
24. Peltzer, K. (2012). Correlates of HIV infection among people visiting public HIVcounseling and testing clinics in Mpumalanga, South Africa. *African Health Sciences*, 12: 8-16.
25. Rehle, T.M., Hallett, T.B., Shisana, O., Pillay-van, W.Y.k., Zuma, K., Carrara, H. and Jooste, S. (2010). A decline in new HIV infections in South Africa: estimating HIV incidence from three national HIV surveys in 2002, 2005 and 2008. *PLoS One*, 5(6):e11094.

26. Sanders, E.J., Okuku, H.S., Smith, A.D., Mwangome, M. Wahome, E., Fegan, G., Peshu, N., van der Elst, E.M., Price, M.A., McClelland, R.S. and Graham, S.M. (2013). High HIV-1 incidence, correlates of HIV-1 acquisition, and high viral loads following seroconversion among MSM. *AIDS*, 27: 437-46.
27. Tenkorang, E.Y. (2014). Marriage, widowhood, divorce and HIV risks among women in sub-Saharan Africa. *International Health*. 6:46-53.
28. Terán, C.C., Urizar, G.D., Blazquez, C.G., Ferreras, A.B., Rubio, R.O., Bolumar, M., Ortiz, R. and del Amo, V.J. (2015). Knowledge, attitudes and practices on HIV/AIDS and prevalence of HIV in the general population of Sucre, Bolivia. *Brazilian Journal of Infectious Diseases*, 19, 369-375.
29. The Joint United Nations Programme on HIV/AIDS (UNAIDS) (2014). The Gap Report. http://files.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/UNAIDS_Gap_report_en.pdf (accessed March 2018).
30. The Joint United Nations Programme on HIV/AIDS (UNAIDS) (2016) Prevention gap report 2016. www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf (accessed May 2018).
31. United Nations Children's Fund (UNICEF) (2011). Comprehensive knowledge of HIV prevention among young people. UNICEF State of the World Children. https://www.unicef.org/nigeria/factsheets_HIV_low.pdf (accessed May 2018).
32. Zheng, Y., Chen, J., Liu, L., Zhang, R., Sun, J. and Lu, H. (2010). Understanding the behavioral and social characteristics of VCT clients in a Shanghai hospital, China. *AIDS Care*, 22: 909-914.
33. Zuma, K., Setswe, G., Ketye, T., Mzolo, T., Rehle, T. and Mbelle, N. (2010). Age at sexual debut: a determinant of multiple partnership among South African youth. *Africa Journal of Reproductive Health*, 14: 47-54.