Tropical Journal of Pharmaceutical Research October 2020; 19 (10): 2197-2204
ISSN: 1596-5996 (print); 1596-9827 (electronic)

Available online at http://www.tjpr.org
http://dx.doi.org/10.4314/tjpr.v19i10.25

Original Research Article

Medication Adherence and Health Status in HIV Positive Patients in Akwa Ibom State, Nigeria

Idongesit L Jackson[1], Samuel S Umoh[1], Patrick O Erah[2]
[1]Department of Clinical Pharmacy and Biopharmacy, University of Uyo, Akwa Ibom State, [2]Department of Clinical Pharmacy and Pharmacy Practice, University of Benin, Edo State, Nigeria

For correspondence:* ***Email:* *idongesitjackson@uniuyo.edu.ng;* ***Tel:*** *+234-7035335381*

Sent for review: 19 January 2020 *Revised accepted: 16 March 2020*

Abstract

Purpose: *To assess medication adherence and health status in ambulatory HIV positive patients in Akwa Ibom State, Nigeria.*
Methods: *The 7-item Adherence to Refills and Medication Scale (ARMS-7) was used to assess medication adherence among 500 HIV positive patients in three secondary health facilities in Akwa Ibom State, Nigeria. A single-item question (measuring self-rated health) and depression (CESD-R) questionnaire were also used to evaluate the patients. Recent CD4 count and viral load were obtained from the patients' folders. The association between independent and dependent variables was evaluated using logistic regression analysis.*
Results: *Only 56 (11.7%) respondents reported 100% adherence to their medications; 190 (39.7%) rated their health as being 'very good' and 51 (10.7%) reported being depressed. Respondents who were single were more likely to be nonadherent (aOR = 2.665, 95% CI = 1.336 - 5.318; p = 0.005), and the nonadherent patients were more likely to have lower CD4 cell counts (aOR = 0.998, CI = 0.996 – 0.999; p = 0.007). Those who rated their health as 'fair' or 'poor' were more likely to be nonadherent (aOR= 11.380, CI = 1.527 – 84.785; p=0.018) and depressed (aOR = 2.748, CI = 1.469 – 5.141; p = 0.002). Patients who were unemployed were more likely to rate their health as fair/poor (aOR = 1.890, CI = 1.197 – 2.985; p=0.006).*
Conclusion: *This work has shown that even though most of the HIV positive patients perceive their health as being very good, their adherence to medications was poor which is directly related to their unemployment status. Intervention to improve adherence directed at socio-economic status of the individual patient is recommended.*

Keywords: *Medication adherence; Depression; Self-rated health; Nigeria*

Tropical Journal of Pharmaceutical Research is indexed by Science Citation Index (SciSearch), Scopus, International Pharmaceutical Abstract, Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, JournalSeek, Journal Citation Reports/Science Edition, Directory of Open Access Journals (DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

The goals of antiretroviral therapy (ART) are to achieve rapid, maximal and sustained suppression of viral load, preserve or improve immunologic function, reduce the risk of transmission of human immunodeficiency virus (HIV) to sexual partners, prevent mother-to-child transmission, prolong life and improve the overall well-being of persons infected with HIV [1]. However, these benefits cannot be obtained if

HIV positive persons are not adherent to their medications.

Adherence to medication has been defined as the degree to which individuals take medications according to prescription [2], including timing, dosage, and frequency [3]. This may also include a patient attending all clinic appointments [1]. Variability in adherence and clinical outcomes has been observed in HIV infected individuals who are on ART. Behavioral and psychosocial factors like depression [4] and the way patients rate their general health [5] have been adduced to explain this variability. Nonadherence to medication is common among all patient populations particularly among those with chronic illnesses [6].

The way patients perceive or rate their health can influence their adherence to therapy [5], and is significantly associated with increased risk of death particularly among the elderly [16]. Earlier reports indicate that psychiatric disorders can predict poor self-rated health status [11-13], low weight gain, CD4 depletion [14], suicide [15], rapid progression to Acquired Immune Deficiency Syndrome (AIDS), and increase in mortality [11]. In this respect, depression has been shown to be common in persons living with HIV/AIDS (PLWHA) [7-9]. In sub-Saharan Africa, the prevalence of depression among HIV infected individuals on ART ranges from 9% to 32% [10]. Due to its association with medication adherence and depression, self-rated health can be used to screen for depression and also assess (and possibly address) factors responsible for medication nonadherence. For instance, a patient who rates their health as “poor” or “fair” can be probed further with an open-ended question to find out why they rated their health as such [5].

In previous studies, the relationship between medication (non)adherence and depression [4,13,17,18] or adherence to antiretroviral drugs and self-rated health have been reported [5]. To our knowledge, such studies are sparse in Nigeria. For instance, although Oku and colleagues [19] assessed medication adherence and self-reported health status of their respondents, the relationship between both variables was not evaluated; other Nigerian studies [20-26] did not assess health status or depression vis-à-vis adherence to antiretroviral medications. Furthermore, the prevalence of HIV/AIDS in Akwa Ibom State where this study was carried out has remained the highest in the country even though it has reduced from 10.8% in 2014 (national average was 3.0%) to 5.5% in 2018 [27]. Therefore, this study sought to assess medication adherence and self-rated health status and to evaluate their association with depression and other patient variables in HIV positive patients attending clinic at three secondary health institutions in Akwa Ibom State, Nigeria.

METHODS

Study setting

This study was conducted in three State government-owned secondary health facilities (General Hospitals) located in Ikot Ekpene, Etinan and Eket Local Government Areas of Akwa Ibom State in Nigeria. These hospitals were chosen from each of the three senatorial districts of the State (North West, North East and South). At the time of data collection, the HIV/AIDS clinics in these hospitals were supported by Family Health International (FHI, a non-governmental organization) in partnership with the United States Agency for International Development (USAID).

Sample size

A minimum sample size of 384 was calculated based on the formula: $n = Z^2pq/d^2$ using a prevalence (of 50.4%) of ARV medication adherence from a previous study [19]. However, considering possible errors in completing the questionnaires a sample size of 500 patients was targeted for the study.

Selection criteria

Following ethical approval, patients aged 18 years or older who had been diagnosed with HIV/AIDS infection prior to the study period using standard procedure, had been on ART for at least 1 year, and also gave informed consent to participate were recruited for the study. All severely ill or mentally unstable patients and pregnant women were excluded.

Instruments for data collection

Medication adherence was assessed using the 7-item Adherence to Refills and Medication Scale (ARMS) [28,29]. The ARMS is a reliable and validated instrument, with Cronbach’s alpha of 0.82 [29]. Each item asks patients to rate on a 4-point scale how often they do not take or refill their medications (whether deliberately, due to forgetfulness, etc) or how often they run out of their medications. Scores on the scale range from 7 to 28; the higher the score the better the adherence. A score of 28 indicates absolute adherence, while scores less than 28 suggest

some degree of medication non-adherence [30]. Self-rated health was assessed using a single-item question which has been documented as a reliable measure of health status [31,32]. This item asks patients to rate (on a 5-point scale ranging from "Excellent" to "Poor") their health in the past months. The Centre for Epidemiology Studies Depression Scale – Revised (CESD-R) [33] was used to measure depression. This is a validated (Cronbach's α=0.86) 10-item instrument which questions how often a person has felt or behaved in a particular way. Response choices, in form of a 4-point Likert scale, range from 'none of the time' to 'all of the time'. Except for items 5 and 8 which are reversed-scored, all items are scored from 0 (rarely or none of the time) to 3 (all of the time). Scores (sum of all ten items) on the CESD-R range from 0 to 30. A score of 10 or greater is indicative of depression.

In addition to these, demographic data of the respondents were obtained using a structured questionnaire. Recent CD4 cell count and viral load (done within the last 3-6 months) were extracted from the patients' case notes.

Data collection

Two research assistants who had been trained assisted with data collection at the study sites. Copies of both questionnaires were distributed to eligible patients while waiting to see the doctor on their HIV clinic appointment. Recent CD4 count and viral load were obtained from the patients' folders. Completed questionnaires were collected on the spot.

Data analysis

Data were analyzed using SPSS ([IBM] version 20.0). Descriptive statistics were used to summarize patients' responses, demographic and clinical data: continuous data were represented by means (±standard deviation) as well as median (interquartile range) for normal and non-normal distributions respectively, while categorical variables were summarized by frequencies and percentages. Medication adherence and health status were treated as dichotomous variables (nonadherent = 1, adherent = 0; fair/poor = 1, excellent/very good/good = 0) in the analyses. Binary logistic regression was conducted with each patient characteristic as the independent variable and the clinical outcomes (medication adherence and health status) as the dependent variables. The independent variables which were significantly associated with both outcome variables were then included in multiple logistic regression to assess the actual predictor(s) of the latter in the final model (adjusted). At 95% confidence interval, statistical significance was set at $P \leq 0.05$.

RESULTS

Out of the 500 questionnaires distributed, 488 were retrieved yielding a response rate of 97.6%. However, 10 were not used due to incompleteness of required data.

Demographic and clinical data of respondents

The mean age of respondents was 38.0 ± 11.2 years and females constituted about two-thirds (n = 340, 71.1%) of the sample. Most of the respondents (58.7%) had been on antiretroviral drugs for 4 to 6 years. One hundred and ninety-three (40.4%) had up to secondary education while 35 (7.3%) said they had no formal education. Almost half of the respondents (46.0%) were married. Two hundred and seventy-three (57.1%) indicated that they were currently working. Only 46 (9.6%) of the respondents indicated the presence of at least a comorbidity. Details of the demographic characteristics of the respondents are given in Table 1 while the clinical characteristics are given in Table 2.

Table 1: Demographic characteristics of respondents (N=478)

Variable	Frequency	Percentage
Gender		
Male	138	28.9
Female	340	71.1
Age (years)		
≤30	153	32.0
31-40	137	28.7
41-50	117	24.5
51-60	58	12.1
>60	13	2.7
Mean* ± *SD	38.0 ± 11.2	
Highest Education		
None	35	7.3
Primary	110	23.0
Secondary	193	40.4
Tertiary	140	29.3
Marital Status		
Single	172	36.0
Married	220	46.0
Widowed	55	11.5
Divorced	31	6.5
Employment Status		
Working	273	57.1
Not working	205	42.9
Living alone		
Yes	171	35.8
No	307	64.2

Table 2: Clinical Characteristics of Respondents

Variable	Frequency	Percentage
Presence of comorbidity		
Yes	46	9.6
No	432	90.4
Viral load (*copies/mL*)[1]		
≤1,000	276	76.7
>1,000	84	23.3
Duration on ARV drugs (years)	156	32.6
≤3	185	58.7
4 – 6	101	21.1
7 – 9	36	7.5
≥10	5.2 ± 2.7	
Mean ± SD		
CD4 cell count (cells/µL)[2]		
≤350	58	16.2
>350	301	83.8
Mean ± SD	587.3± 215.6	
Depressed		
Yes	51	10.7
No	427	89.3

[1]Available for only 360 respondents; [2]Available for only 359 respondents

Medication adherence of participants

Some respondents (56, 11.7%) reported 100% adherence to their antiretroviral drugs while the others (422, 88.3%) reported varying degrees of medication nonadherence. Employment status (odds ratio, OR = 1.842, 95% confidence interval, CI = 1.010 – 3.362); p = 0.046), marital status (OR = 2.328, CI = 1.304 – 4.156; p = 0.004), CD4 count (OR = 0.998, CI = 0.997 – 1.000; p = 0.009) and health rating (OR = 4.994, CI = 1.526 – 16.345; p = 0.008) predicted nonadherence in the unadjusted regression model. However, only marital status, CD4 cell count and health status significantly predicted nonadherence in the final regression model. Respondents who were single (including the divorced and widowed) were more likely to be nonadherent than those who were married (adjusted odds ratio, aOR = 2.665, CI = 1.336 - 5.318; p = 0.005); nonadherent individuals were more likely to have lower CD4 cell counts (aOR = 0.998, CI = 0.996 – 0.999; p = 0.007); and those who rated their health as fair or poor were more likely to be nonadherent (aOR= 11.380, CI = 1.527 – 84.785; p=0.018,). (Table 3).

Self-rated health status among respondents

Most of the respondents (39.7%) rated their health as 'very good' and only 7 (1.5%) rated their health as 'poor'. (Figure 1).

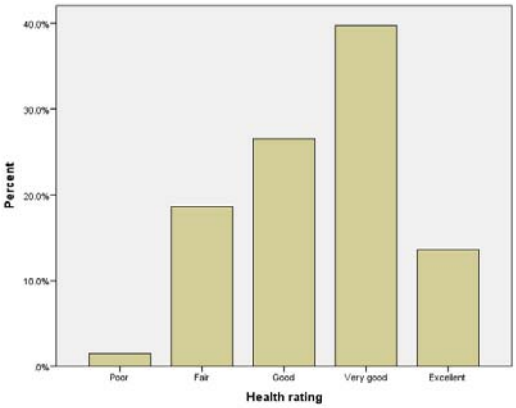

Figure 1: Self-Reported General Health Status of Respondents

Self-rated health was significantly predicted by employment status and depression in both adjusted and unadjusted logistic regression models. Those who were not employed were more likely to rate their health as fair or poor than those who were employed (aOR = 1.890, CI = 1.197 – 2.985; p = 0.006) and the respondents who were depressed were more likely to rate their health as fair/poor than those who were not (aOR = 2.748, CI = 1.469 – 5.141; p = 0.002).

Table 3: Logistic Regression Models Predicting Medication Nonadherence

Variable	Unadjusted OR (CI)	*p* (OR)	Adjusted OR (CI)	*p* (aOR)
Marital status (currently single)	2.328 (1.304 – 4.156)	0.004	2.665 (1.336 – 5.318)	0.005
Employment status (unemployed)	1.843 (1.010 – 3.362)	0.046	-	-
CD4 cell count	0.998 (0.997 – 1.000)	0.009	0.998 (0.996 – 0.999)	0.007
Health status (Fair/poor)	4.994 (1.526 – 16.345)	0.008	11.380 (1.527–84.785)	0.018

Correct predictions = 88.0%, Nalgelkerke R^2 = 16.7% (0.167), X^2= 33.278, degree of freedom, df = 4, p<0.001

Table 4: Logistic Regression Models Predicting Health Status

Variable	Unadjusted OR (CI)	*p*	Adjusted OR (CI)	*p*
Employment status (unemployed)	1.865 (1.188 – 2.929)	0.007	1.890 (1.197 – 2.985)	0.006
Depression (depressed)	2.699 (1.453 – 5.012)	0.002	2.748 (1.469 – 5.141)	0.002

Correct predictions = 79.9%, Nalgelkerke R^2 = 0.054, X^2= 16.661, df = 2, p<0.001

DISCUSSION

In this study, medication adherence was poor. The reported health status of our participants was generally 'very good' and the proportion who reported being depressed was low. Only marital status, CD4 cell count and health status significantly predicted nonadherence while self-rated health was significantly predicted by employment status and depression.

The low medication adherence observed in our study contradicts earlier studies [9,19-26,29,34]. While it can be argued that the differences in some of the earlier reports [9,19-26, 34] can be explained on the basis of differences in the instruments used for assessing adherence and/or the variability in the methods of calculating or classifying adherence, these factors cannot explained the differences in respect of the report from Kripalani and colleagues [29] which measured adherence with the same tool used in the present study. However, differences in geographical study settings and the socioeconomic background of our sample may explain the differences. In line with previous studies [5,19,35], most of the patient variables in our study were not significantly associated with medication adherence. However, marital status, CD4 cell count and self-rated health status of patients predicted medication nonadherence. Contrary to some earlier studies [25,36] which reported no significant association between marital status and nonadherence to antiretroviral medications, our study showed a significant association between both variables. Similar results have been documented [23,26]. In this study, those who were single (comprising those who were not married, were widowed or divorced) were more likely to be nonadherent than those who were married. This finding may be due to the fact that someone living with a spouse may usually be encouraged or reminded to take their medications regularly. Lack of medication reminders from family/friends has been reported as one of the reasons for nonadherence [37]. In contrast to the report of an earlier study in Nigeria [24], nonadherent individuals in our study were more likely to have lower CD4 cell counts. In line with our findings, Memiah and colleagues [17] reported less adherence in respondents with CD4 count less than 200copies/μL. However, a Tanzanian study [38] showed that nonadherence was associated with higher CD4 cell counts among respondents.

In line with the report of Wroe and colleagues [18], the prevalence of depression reported by our participants was relatively low when compared to earlier studies [7,9,17,24,34]. However, an even lower prevalence of 9.6% was reported in a Ugandan study [39]. Since depression was self-reported in the present study, respondents may have under-reported this psychological disorder. In a study with 55 individuals, only two-thirds of the participants who were diagnosed with depression actually reported symptoms of depression [40]. The beneficial effects of antiretroviral therapy and counselling could also be adduced to explain this finding [39]. The low depression prevalence notwithstanding, early detection and effective treatment of this disorder is warranted in all PLWHA.

Our study corroborated the report from a study conducted among patients in Nigeria [19] which indicated that most respondents rated their health as being 'very good'. Such health rating was significantly associated with adherence in this study. Thus, respondents who reported nonadherence to medication were more likely to rate their health as fair/poor, in line with the findings reported by Cardarelli and colleagues [5]. Similarly, Oku and colleagues [19] reported that respondents who indicated that their health had improved since commencement of ART were more adherent to treatment than those who did not perceive any improvement. Our finding that depressed patients were more likely to rate their health as fair/poor than those who reported not being depressed is consistent with an earlier study [41] which reported self-rated health status as one of the strongest predictors of depression among HIV-positive men who often inject drugs. However, since this was a cross-sectional study, causality was not ascertained.

In this study, employment status also predicted respondents' health status. Those who reported being unemployed were more likely to rate their health as fair/poor than those who were employed. A possible reason could be the significant correlation between depression and employment status (result not shown) in this study as well as in previous reports [42-44].

There are possible limitations to be considered when interpreting the results of this study. First, the study was done in secondary health facilities in one State in the country. Second, convenient sampling method employed in recruiting respondents could under-represent the study population. Third, causality could not be ascertained since the cross-sectional study design was employed. Finally, our data were obtained by self-reporting hence, recall bias and social desirability bias could not be ruled out.

CONCLUSION

This work has shown that most of the HIV positive patients adhered poorly to medications even though they perceived their health as being very good. Nonadherence to medication was dependent on marital status, CD4 cell count and health status while self-rated health was significantly predicted by employment status and depression. Our results imply that individuals will benefit from treatment and counselling sessions tailored to their specific needs. HIV adherence counsellors in particular, should not be in a haste to blame patients for poor adherence or poor clinical outcomes such as low CD4 count or high viral load. Rather, they should seek to know possible reasons for such observation. Particular attention should be placed on patients that are not currently married (including those who are separated, divorced, or widowed) or employed. Follow-up interventional studies are recommended to ascertain causality and evaluate outcomes of interventions to improve adherence in PLWHA.

DECLARATIONS

Acknowledgement

The authors acknowledge the respondents that participated in the survey.

Conflict of interest

None declared.

Authors' contributions

This work was done by all three authors named in this article. ILJ conceived and analyzed the work; SSU was involved in data collection and in writing the initial draft of the manuscript; POE supervised the work and reviewed the final draft of the manuscript which was approved by all authors.

REFERENCES

1. *Nigeria. Federal Ministry of Health. Integrated National Guidelines for HIV Prevention Treatment and Care: National AIDS/STIs Control Programme. Abuja: Federal Ministry of Health; 2014. Available from: https://www.childrenandaids.org/sites/default/files/2017-05/Nigeria-Integrated-National-Guildlines-For-HIV-Prevention-treatment-and-care-2014.pdf*
2. *Osterberg L, Blaschke T. Drug Therapy. Adherence to Medication. N Engl J Med 2005; 353:487-497.*
3. *Albrecht S. The Pharmacist's role in medication adherence. US Pharm, 2011, 36(5),45-48.*
4. *Belenky NM, Cole SR, Pence BW, Itemba D, Maro V, Whetten K. Depressive Symptoms, HIV Medication Adherence, and HIV Clinical Outcomes in Tanzania: A Prospective, Observational Study. PLoS One 2014; 9(5), e95469.*
5. *Cardarelli R, Weis S, Adams E, Radaford D, Vecino I, Munguia, G., Johnson, K. L, Fulda KG. General Health Status and Adherence to Antiretroviral Therapy. J Int Assoc Provid AIDS Care 2008;7(3):123-129.*
6. *Munger MA, Van Tassel BW, LaFleur J. Medication nonadherence: An unrecognized cardiovascular Risk factor. Med Gen Med 2007; 9(3):58.*
7. *Bhatia MS, Munjal S. Prevalence of Depression in People Living with HIV/AIDS Undergoing ART and Factors Associated with it. J Clin Diagn Res 2014; 8(10): WC01-WC04.*
8. *Figuero LS, Luque PB, Martin T P, Sagrado MG, Bouza JM. Assessment of factors influencing health-related quality of life in HIV-infected patients. HIV Med 2011; 12:22-30.*
9. *Ofovwe CE, Ofovwe C. Psychological disorders among human immunodeficiency virus infected adults in Southern Nigeria. Afr J Reprod Health 2013; 17:177-182.*
10. *Bernard C, Dabis F, de Rekeneire N. Prevalence and factors associated with depression in people living with HIV in sub-Saharan Africa: A systematic review and meta-analysis. PLoS One 2017; 12(8): e0181960.*
11. *Abas M, Ali G-C, Nakimuli-Mpungu E, Chibanda, D. Depression in people living with HIV in sub-Saharan Africa: time to act. Trop Med Int Health 2014; 19:1392–1396.*
12. *Chang-Quan H, Xue-Mei Z, Bi-Rong D, Zhen-Chan L, Ji-Rong Y, Qing-Xiu L. Health status and risk for depression among the elderly: a meta-analysis of published literature. Age Ageing 2010; 39:23–30.*
13. *Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS Treatment Nonadherence: A Review and Meta-analysis. J Acquir Immune Defic Syndr 2011;58(2).*
14. *Kingori C, Haile ZT, Ngatia P. Depression symptoms, social support and overall health among HIV-positive individuals in Kenya. Int J STD AIDS 2015; 26:165–172.*
15. *Kinyanda E, Hoskins S, Nakku J, Nawaz S, Patel V. The prevalence and characteristics of suicidality in HIV/AIDS*

as seen in an African population in Entebbe district, Uganda. BMC Psychiatry 2012; 12:63.

16. *Burstrom B, Fredlund P. Self-rated health: is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes? J Epidemiol Community Health 2001; 55:836-840.*
17. *Memiah P, Shumba C, Etienne-Mesubi M, Agbor S, Hossain MB, Komba, P, Niyang M, Biadgilign S. The effect of depressive symptoms and CD4 count on adherence to highly active antiretroviral therapy in sub-Saharan Africa. J Int Assoc Provid AIDS Care 2014; 13:346–352.*
18. *Wroe EB, Hedt-Gauthier BL, Franke MF, Nsanzimana S, Turinimana JB, Drobac P. Depression and patterns of self-reported adherence to antiretroviral therapy in Rwanda. Int J STD AIDS 2015; 26:257–261.*
19. *Oku AO, Owoaje ET, Oku OO, Monjok E. Prevalence and Determinants of Adherence to Highly Active Retroviral Therapy amongst People Living with HIV/AIDS in a Rural Setting in South-South Nigeria. Afr J Reprod Health 2014;18(1):133-143.*
20. *Nwauche CA, Erhabor O, Ejele OA, Akani CI. Adherence to antiretroviral therapy among HIV-infected subjects in a resource - limited setting in the Niger Delta of Nigeria. Afr J Health Sci 2006; 13:13-17.*
21. *Falang KD, Akubaba P, Jimam NS. (2012) Patient factors impacting antiretroviral drug adherence in a Nigerian tertiary hospital. J Pharmacol Pharmacother 2012;3(2):138-142.*
22. *Salami AK, Fadeyi A, Ogunmodede JA, Desalu O. Factors influencing adherence to antiretroviral medication in Ilorin, Nigeria. J Int Assoc Provid AIDS Care 2010;9(3):191-195.*
23. *Uzochukwu B, Onwujekwe O, Onoka C, Okoli C, Uguru N, Chukwuogo O. Determinants of non-adherence to subsidized anti-retroviral treatment in southeast Nigeria. Health Policy Plan 2009;24(3):189-196.*
24. *Erah P, Arute J. Adherence of HIV/AIDS patients to antiretroviral therapy in a tertiary health facility in Benin City. Afr J Pharm Pharmacol 2008; 2(7):145- 152.*
25. *Afe AJ, Motunrayo O, Ogungbade GO. Factors Influencing Adherence to HAART among patients living with HIV infection in Southwest Nigeria: A cross-sectional analysis. J HIV Retrovirus 2018;4(1):1.*
26. *Odili VU, Obieche AO, Amibor KC. Adherence to antiretroviral therapy and its determinants among HIV-infected patients in Nigeria. J. Pharm Pract 2017;30(3):291-295.*
27. *Ukpong, C. Akwa Ibom blames high rate of HIV/AIDS on influx of visitors. Premium Times [newspaper on the Internet]. 2019 Apr 13 [cited 2020 Feb 01]. Available from: https://www.premiumtimesng.com/regional/south-south-regional/325273-akwa-ibom-blames-high-rate-of-hiv-aids-on-influx-of-visitors.html.*
28. *Kripalani S, Risser J, Gatti ME, Jacobson TA. Development and evaluation of the Adherence to Refills and Medications Scale (ARMS) among low-literacy patients with chronic disease. Value Health 2009;12(1):118–123.*
29. *Kripalani S, Goggins K, Nwosu S, Schildcrout J, Mixon AS, McNaughton C, Scott AM, Wallston KA; Vanderbilt Inpatient Cohort Study. Medication Nonadherence before hospitalization for acute cardiac events. J Health Commun 2015 Oct:9;20 Suppl 2(0):34-42.*
30. *Kripalani S, Henderson LE, Jacobson TA, Vaccarino V. Medication use among inner-city patients after hospital discharge: Patient-reported barriers and solutions. Mayo Clin Proc 2008;83(5):529–535.*
31. *DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis. J Gen Intern Med 2006; 21:267-275.*
32. *Macias C, Gold PB, Ongur D, Cohen BM, Panch T. Are single-item global ratings useful for assessing health status? J Clin Psychol Med Settings 2015;22(4):251-264.*
33. *Van Dam NT, Earleywine M. Validation of the Center for Epidemiologic Studies Depression Scale—Revised (CESD-R): pragmatic depression assessment in the general population. Psychiatry Res 2011;186(1):128-132.*
34. *Moraes RP, Casseb J. Depression and adherence to antiretroviral treatment in HIV-positive men in São Paulo, the largest city in South America: Social and psychological implications. Clinics (Sao Paulo, Brazil) 2017;72(12):743-749.*
35. *Talam NC, Gatongi P, Rotich S. Factors Affecting Antiretroviral Drug Adherence among HIV/AIDS Adult Patients attending HIV/AIDS clinic at Moi Teaching and Referral Hospital, Eldoret, Kenya. East Afr J Public Health 2008;5(2):74-78.*
36. *Dibaba B, Hussein M. Factors Associated with Non-Adherence to Antiretroviral Therapy among Adults living with HIV/AIDS in Arsi Zone, Oromia. J AIDS Clin Res 2017; 8:647.*
37. *Shah B, Walshe L, Saple DG, Mehta SH, Ramnani JP, Kharkar RD, Robert C. Bollinger RC, Gupta A. Adherence to Antiretroviral Therapy and Virologic Suppression among HIV-Infected Persons Receiving Care in Private Clinics in Mumbai.Clin Infect Dis 2007;44(9):1235-1244.*
38. *Muya AN, Geldsetzer P, Hertzmark E, Ezeamama AE, Kawawa H, Hawkins C, Sando D, Chalamilla G, Fawzi W, Spiegelman D. Predictors of nonadherence to antiretroviral therapy among HIV-infected adults in Dar es Salaam, Tanzania. J Int Assoc Provid AIDS Care 2015; 14(2):163–171.*
39. *Martin F, Russell S, Seeley J. Higher Quality of Life and Lower Depression for People on ART in Uganda as Compared to a Community Control Group. PLoS One 2014;9: e105154.*
40. *Porche DJ, Willis DG. Depression in HIV-infected men. Issues Ment Health Nurs 2006;27(4):391–401.*
41. *Levintow SN, Pence BW, Ha TV, Minh NL, Sripaipan T, Latkin CA, Vu PT, Quan VM, Frangakis C, Go VF.*

Prevalence and predictors of depressive symptoms among HIV-positive men who inject drugs in Vietnam. PLoS One 2018 Jan 24;13(1): e0191548.

42. *Ngum PA, Fon PN, Ngu RC, Verla VS, Luma HN. Depression among HIV/AIDS Patients on Highly Active Antiretroviral Therapy in the Southwest Regional Hospitals of Cameroon: A Cross-Sectional Study. Neurol Ther 2017;6(1):103–114.*
43. *Wilson SH, Walker GM. Unemployment and health: a review. Public Health 1993;107(3):153–162.*
44. *Montgomery SM, Cook DG, Bartley MJ, Wadsworth MEJ. Unemployment pre-dates symptoms of depression and anxiety resulting in medical consultation in young men. Int J Epidemiol 1999; 28(1):95–100.*