



FACTORS AFFECTING ANTIRETROVIRAL MEDICATION ADHERENCE AMONG PLWHA IN ARDOKOLA AND GASSOL LGAs OF TARABA STATE, NIGERIA

Principal Investigator: Chiegil Joseph Solomon¹, Doctor of Public Health, College of Nursing, Jalingo;

Co-Authors: Sadiq Abubakar², Hajara Abdulrazaq³, Khadija MD Ibraheem⁴, Christiana Yamusa Adamu⁵, Edna Paul Anuye⁶, Akafa Tebrimam Rahila⁷, Iranum Nimiruna⁸
Global Healthplus Public Initiative¹, College of Nursing Sciences Jalingo^{2,3,4}, School of Midwifery Jalingo^{5,6,7,8}

Corresponding Author: Chiegil Joseph Solomon (PhD), +2348087747272,
globalhealth.initiative@yahoo.com

Abstract

Background: HIV/AIDS is globally a public health threat needing optimum medication-Adherence to reduce transmission and improve quality of life.

Objective: Survey design was used to assess the level of Antiretroviral Medication Adherence of PLWHA.

Methodology: Precede model significantly explained how ARVs adherence can be achieved efficiently in HIV/AIDS treatment. Descriptive Survey design with validated questionnaire was used to gather information from 60 PLWHA. This followed ethical approval from Taraba State College of Nursing Science Research Ethics Committee and informed consent from participants. Descriptive statistics and frequency distributions were employed in the analysis of data. Validity and reliability of Instrument were tested with Cronbach Alpha, 0.795.

Results: Study recorded Mean age of participants 35.4 ± 9.061 ; Majority were married (61%) females (66%) and self-employed (41.7%) Mumuye ethnic group (28.3%), of Christian faith (71.7%) and lower educational attainments (56.6%). predisposing factors on reference scale of 137-points, reported $\bar{X} = 82.17(2.18) \pm 11.92$; Perceptions on 105-point, $\bar{X} = 60.33(1.88) \pm 10.30$; Attitude on 21-points scale, $\bar{X} = 13.17(0.57) \pm 3.12$; Reinforcing factors on 15-points scale, scored $\bar{X} = 9.00(0.65) \pm 3.65$; Enabling factors on 15-points reference scale reported $\bar{X} = 8.23(0.46) \pm 2.50$ and Self-Reported Adherence and Appointment Keeping on 24-points reference scale was $\bar{X} = 16.23(0.82) \pm 4.49$ and Adherence prevalence rate for this group was 67.6%.

Conclusion: Intervention Programs should be intensified in HIV treatment to optimize Adherence level to the recommended minimum of 95%.

Key words: Demography, Education, Adherence, Predisposing, Reinforcing.

Words Count: (250)

INTRODUCTION

1.1 Background to the study

Millions of people have died from AIDS-related causes out of the thirty-seven millions currently and globally living with the virus since the beginning of the epidemic (Who, 2017). The World Health Organization (WHO) had it that over 70 million people are infected with HIV virus with death of an average of 36 million people since the first cases were reported in 1981 with 1.6 million HIV-related deaths in 2012. The most severely affected remains the Sub-Saharan region and account for 69% of the total number of people living with HIV globally (Fettig, JMS, Swaminathan, MMD, Murrill, CS and Kaplan, JMD, 2014 and Who, 2017). Out of every twenty adults, one is said to be living with the disease in this region (Who, 2017). HIV was first reported among gay men in some regions of the United states of America in 1981 (Denis and Becker, 2006), and since then the virus has affected all people of different sexual, ethnic, geographic, and racial orientation, and has spread to all parts of the globe. The first case of HIV was reported in Nigeria in 1986 (Happy Boss, 2017) thereafter, the prevalence rose sharply and then declined, giving a national prevalence rate of 4.1% as at 2010 and 2015, 3.10 (FMH, 2015) (With a rate of 0.9% among people ages 15-49). The second largest population of people living with HIV in the world live in Nigeria (oluwaveeboy, 2014) with an estimated 210,000 deaths due to AIDS recorded in 2011 and 160, 000 (2016) in Nigeria (UNAIDS, 2017).

The disease burden is worrisome and has impacted disastrously across the globe (CDC, 2017). However, with the advent of antiretroviral medications, the disease management has been transformed. This reduced mortality from HIV infection within a period of 10 years by about 50% - 80% with resultant drop in the burden of HIV and AIDs (Gonzalo, García Goñi, and Muñoz-Fernández, 2009). Researchers have demonstrated preventive and therapeutic antiretroviral therapy benefits (Hyle and Dryden-Peterson, 2017, UNAIDS, 2016, and Bendavid, Holmes, Bhattacharya and Miller, 2012). They emphasized the importance of adherence to treatment in achieving positive clinical outcomes and bringing to halt, the progression to AIDS (Chiegil, 2017). Poor ARVs adherence is associated with grave consequences locally and globally. Poor adherence to antiretroviral therapy was a major predictor of progression to AIDS and death in a study of Gonzalo, et al, 2009, it determined failure or success of ARVs and improvement in clinical condition of the patient receiving care. Resistance strains of the virus develop with poor adherence to medication and eventually the medications lose their potency. Researchers have also argued that for best outcome from ARVs, medication adherence is

standardized to be the use of not less than 95% of prescribed ARVs at a given period of medication refills (Ho, Bryson, and Rumsfeld (2009) and McKenney, Munroe, and Wright, Jr (1992).

3.0 Methodology

This study was conducted in First Referral Hospital, Sunkani, Ardo kola and Mutum biyu, Gassol LGAs respectively, both public Health Facilities located at southern part of Jalingo (Location: coordinates 8°59'42.72" N 11°44'48.08" E, and Longitude 8°37'60" N & 10°46'0" E, respectively). Population of these Districts are majorly peti farmers/ Traders and Civil Servants. The two Health facilities are both ART centers and manages PLWHA with client attendants from mandays to fridays.

Survey design was used with validated questionnaire to gather Information from 100 *PLWHA* about predisposing factors, Enabling, Reinforcing and adherence behavior (Cronbach's Alpha 0.795). Informed consent was given to participants who can decline consent at any stage of the study. Interviewer Administered questionnaire (English) with Measures conceptualized from precede model (Green 1974) was served by three trained field Assistants to HIV Clinic-Attendees within a period of five days.

Predisposing factors: Fifty-three items constitute this construct on reference scale of 137, which was further divided into 5 sub-sections as follows:

Conscious Awareness and Knowledge about HIV and Treatment, Knowledge about HIV Infectivity and Treatment outcomes, Information Adequacy or Scope of contents of Health Counsel and Messages about HIV Treatment, Perceptions about HIV Treatment.

The second part was perceived threats with 10 items measured on the scale of 30 points and investigating Perceived Severity of symptoms associated with AIDS and perceived severity of non-compliance to ART medication. The next sub-variable is perceived barrier, Perceived Self-efficacy. Attitudinal Disposition of Mothers towards Health Counsel and Messages Delivered at Infant- Welfare Clinics with seven items measuring the attitude of mothers towards Health information on a 21-point reference scale. Reinforcing and Enabling Factors in ART Medication offered by Social Support has 10 items measured on a 30-point scale. Medication Adherence and Appointment-Keeping Behavior used 8 items with response pattern of on a 24-point scale.

Inclusion criteria was all consenting *PLWHA* and using Health Facility for ART however, those who were severely indisposed were exempted from the study.

Data collection procedures

Questionnaires were designed in English, pre-tested and interviewer administered by two trained Research Assistants after consenting to the study.

Data Analysis

Data was analyzed using computer software, SPSS version 21 to obtain descriptive statistics like mean, standard deviations. Frequencies and Analysis of variance were analyzed.

Ethical Issues

Permission to carry out study was sought for, from Taraba State Ministry of Health, followed by Permission from the heads of the two Hospitals studied. Informed consent was also obtained from all clients studied with an option of withdrawing at any stage of the study.

Conflict of interest

There was no any grant nor is there any conflict of interest in this study

RESULTS

4.1 Demographic Characteristics of Respondents

The study enrolled 35 (33.3%) males and 55 (66.7%) Females (N= 60), who responded to the questionnaires. The ages of the respondents ranged between 16 years to 59 years with a mean score of 35.38 and standard deviation of 9.061, most of whom were married (37.61%) and of Christian faith (71.7%). The educational status of the respondents ranged from non-formal to higher education with majority being of the lower educational attainments (56.6%). The Mumuye ethnic group constituted majority of the respondents (28.3%), mostly, the self-employed (41.7%) as found on table 4.1.

Table 4.1: Frequency distribution of demographic characteristics of respondents in this study

Variables	*** (N = 60)	
	N	(%)
Sex		
Male	20	33.3
Female	40	66.7
Marital Status		
Single	20	33.3
Married	37	61.7
Separated	3	5.0
Religion		
Christian	43	71.7
Islam	17	28.3
Education		
Non-Formal	9	15.0
Primary	8	13.3
Secondary	17	28.3
Higher	26	43.3
Ethnicity		
Mumuye	17	28.3
Tiv	7	11.7

Fulani	7	11.7
Hausa	9	15
Jenjo	5	8.3
Others	15	25.0
Occupation		
Self-employed	25	41.7
Civil Servant	20	33.3
Applicant	6	10.0
Housewife	5	8.3
Student	4	6.7



*** Respondents in this study

4.2.1 Predisposing Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study

In this study, Predisposing Factors associated within HIV-Medication Adherence was evaluated with 53 items and measured on 137-point reference scale and involved three sub-variables of Conscious Awareness and Knowledge about HIV and Treatment, Perceptions about HIV Treatment and Attitudinal Disposition of PLWHAs towards health counsel and messages delivered at HIV clinics.

Results showed that the level of predisposing factors in HIV-Medication Adherence, measured on a scale of 137 points scored a mean of 82.17 (2.18) \pm 11.92 being 60% of reference scale for control. This means there was average levels of predisposing factors in medication adherence and appointment keeping. Conscious Awareness and Knowledge about HIV Infectivity and Treatment Outcomes measured on 11-point reference scale revealed that participants had a mean score of 8.6 (0.22) \pm 1.18

being 78% of the reference scale. This showed that the level of Conscious Awareness and Knowledge about HIV Infectivity and Treatment Outcomes reported as received by PLWHA were high. Perceptions about HIV treatment was considered as 35 items on 105-point scale and involved five sub-variables of perception of confidence about usefulness and applicability of health counsel and messages delivered to PLWHAs in clinics; perceived benefits, perceived threats, perceived barriers and perceived self-efficacy about HIV medication Adherence skills. Perceptions about HIV treatment reported a mean score of $60.33 (1.88) \pm 10.30$ representing 57.5% of reference scale. This showed that the level of Perception about HIV was generally above average levels (See table 4.2). Attitude was measured using 7 items on a maximum reference scale of 21-points. Respondents reported the level of Attitudinal Disposition giving a mean score of $13.17 (0.57) \pm 3.12$ being 62.7% of the reference scale. This showed that respondents' Attitudinal Disposition is above average level.

Table 4.2 Measures of Predisposing Factors involved in Medication Adherence in HIV/AIDS Treatment in this study.

VARIABLES	Reference Scale	***N=30	
		$\bar{X}(SE)$	$\pm SD$
PREDISPOSING FACTORS	137	82.17(2.18)	11.92
Conscious Awareness and Knowledge about HIV and Treatment	11	8.67(0.22)	1.18
<i>Information Adequacy about HIV Treatment</i>	6	5.00(0.17)	0.95
<i>Knowledge about HIV</i>	5	3.67(0.20)	1.09
Perceptions about HIV Treatment	105	60.33(1.88)	10.30
<i>Perceived Confidence about usefulness of information received</i>	27	18.87(0.75)	4.13
<i>Perceive Benefits</i>	18	6.87(0.48)	2.64
<i>Perceived Threat</i>	30	15.33(0.61)	3.34
<i>Perceived Barriers</i>	15	8.70(0.54)	2.96
<i>Perceived Self-Efficacy</i>	15	10.57(0.55)	3.01
Attitudinal Disposition	21	13.17(0.57)	3.12

***Respondents in this study

Table 4.3: Measures of Reinforcing, Enabling factors and Self-Reported Medication Adherence in HIV/AIDS Treatment in this study.

VARIABLES	Reference Scale	***N=30	
		$\bar{X}(SE)$	$\pm SD$

Reinforcing Factors	15	9.00(0.65)	3.56
Enabling Factors	15	8.23(0.46)	2.50
Self-Reported Medication-Adherence and Appointment-keeping (SRMA)	24	16.23(0.82)	4.49

***Respondents in this study

4.2.2 Reinforcing, Enabling Factors and Self-Reported Medication-Adherence in ART Medication involved in HIV/AIDS Treatment in this study

In this study, Reinforcing Factors in ART Medication were considered as 5 items measured on 15 points scale. Results showed that respondents reported a mean score of 9.00 (0.65) \pm 3.56, representing 60% of the reference scale. This shows that the level of Reinforcing Factors in ART Medication was above average. Enabling Factors in ART Medication, on a reference scale of 15-points reported a mean score of 8.23 (0.46) \pm 2.50 (54.9%). This showed that the level of Enabling Factors in ART Medication is at average level. Self-Reported Adherence with reference scale of 24 points reported a mean score of 16.23 (0.82) \pm 4.49 being 67.6% of the reference scale. This revealed that Adherence to HIV-Information and Medication instructions, including appointment keeping was at intermediate levels (above average). This information is found on table 4.3.

DISCUSSION OF RESULTS

5.0 Introduction

The aim of this study was to assess the level of Antiretroviral Medication Adherence of PLWHA in Gassol, Taraba State. In this study, the constructs of the precede model was used to explain specific behavior that are likely Adherence predictors. Four specific objectives that guided the study were achieved and includes, to:

The specific objectives that guided the study includes, to:

1. Determine the level of Predisposing Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study

2. Determine the level of Reinforcing Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study
3. Determine the level of Enabling Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study
4. Determine the level of Self-Reported Medication-Adherence in ART Medication in this study.

The discussion is based on Research Questions and the implications for the answers are also commented on. However, the demographic characteristics of the respondents are presented first.

5.1 Demographic Characteristics of Respondents in this study

Results showed that a wide range of age categories were represented in the study with age mean score of 35.38, SD \pm 9.06 and age range of 16-59. This corresponds with the reports of the Federal Ministry of Health (2015), that HIV national prevalence rate was 4.1% as at 2010 and 2015 with a rate of 0.9% among people aged 15-49. Majority of the respondents were of ages of accountability and holds responsibilities for themselves and for others under them. More of the participants were also of Female gender (66.7%), self-employed, either unmarried or separated. These are felt to be increasing their vulnerability socio-economically and emotionally. Other reasons for over representation of the female gender is felt to be due to their better health seeking behavior, they tend to have better contact with the Health Care System especially, visits to Ante-natal clinics (ANC) and Post-natal Clinics. The Female gender takes up caring responsibilities; they take the sick to the health facility and resultantly use the opportunity to check-up their health status. In short, women are always concerned about themselves; especially their physical outlook and so seek care frequently than men do.

The high rate of poverty and unemployment levels, accounting for over 50% of respondents may be a factor, and which tend to have high impact on the lives of the PLWHA and which may limit their comprehension of HIV related information and hence sub-optimal adherence. The relatively low literacy status of most of the respondents, especially of the female gender (over 30% are non-formal

and primary holders) and their perceived sub-servient social status is felt to account for a larger infection rate amongst them.

The high population of Mumuye ethnic group (28.3%) as majority of the respondents was felt to be attributed to their culturally high social lifestyle of high vulnerability. It could also be due to the subsidy program Taraba health services enjoy and the free ART given by the National Action Committee on AIDS (NACA), which draws patients from the neighboring LGAs and States.

Majority of the participants were reported to be of a Christian faith which could be due to the fact that the study area is pre-dominantly Christian (71.7%) state. However, the linkages of the respondents to the church as reported by a majority could be valuable support mobilization resource vehicle for collaborative linkages between the Health workers, PLWHA, Families, Government, NGOs and other self-support facilities that will foster HIV-Information sharing, comprehension and thus support Adherence (Tables 4.1).

5. **Research Question 1:** What is the level of Predisposing Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study

Predisposing factors are important determinants in medication adherence and possesses the potentials to improve adherence behaviors (Green, 1999). In this study, the level of predisposing factors in HIV-Medication Adherence and appointment keeping was ranging from low to average levels and may be responsible for the continual sub-optimal adherence and treatment failures following the usual traditional and conventional intervention strategies. These factors were considered as given by Green in terms of level of **Conscious** Awareness and Knowledge about HIV Infectivity and Treatment Outcomes reported as received by PLWHA, including the level of Scope of contents of Health Counsel and Messages or *Information Adequacy* Delivered to the PLWHA at the Clinics. The findings of Thailand Ministry of Public Health (2000), who reported that inadequate information from their counselors reaches the clients is similar to findings of this study where knowledge and awareness about treatment regimens become inadequate in many routine clinics under control condition, thereby

resulting in suboptimal adherence. The level of Perception about HIV was generally above average levels. Perception of Confidence, Usefulness and Applicability of Health Counsel and Messages Delivered to PLWHA in Clinics, Perception of benefit of Health Counsel and Messages Delivered to PLWHA in Clinics, Perceived threats, Self-Efficacy involved in HIV treatment and Attitudinal Disposition were all ranging from low to average levels. In similar vein, Gibson, Mary, Esther, Andrew, Amos, mani, Godfather, Chacha, Doris, and Godlisten (2018) reported that low level of predisposing factors such as knowledge on the risk factors, prevention strategies and their associated complications, perceptions and attitudes.

Research Question 2: What is the level of Reinforcing Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study

Results showed that Reinforcing factors in HIV adherence reported a low to average levels. Reasons for this could be the prevailing shortage of staff and long hours of labor in these health facilities so that they have no valuable time to intervene on these determinants. The poor staff salaries and poor funding of these health facilities could also lead to poor motivation of both the staff and the clients and resultantly affecting adherence negatively. This finding is similar to the report of Dawood (2015) who found low levels of Reinforcing factors with high barrier in Adolescent HIV treatment.

Research Question 3: Determine the level of Enabling Factors involved in Medication Adherence and Appointment Keeping in HIV/AIDS Treatment in this study.

The level of Enabling Factors in ART Medication *is* at average level.

Research Question 4: What is the level of Self-Reported Medication-Adherence in ART Medication in this study.

Adherence to HIV-Information and Medication instructions, including appointment keeping is at intermediate levels (above average). When Adherence prevalence rate was computed, it was found to be 60% adherence rate, which is far below that recommended by researchers. However, this rate does not correspond with the arguments of Ho, Bryson, and Rumsfeld (2009) and McKenney, Munroe, and Wright, Jr (1992) who have argued that for best outcome from ARVs, the standard medication

adherence should be not less than 95% of prescribed ARVs at a given period of medication refills. Research work done at rivers southern Nigeria in 2016 revealed a low adherence level of 71.2% (Kanu, Maduka, Okeafor (2017), the low level of adherence has also been reported in other places like Kano (Lawan, Amole, GamboJahun, EneAbute (2015).

5.2 Conclusion

Treatment adherence rate for many patients is sub-optimal, which is felt to be responsible for the prevailing drug resistance and increased transmission of HIV. It is therefore, recommended that strategically targeted theory-grounded Intervention Programs should be intensified in HIV treatment to optimize Adherence levels to the recommended minimum of 95%.



Reference

- Akahara, C., Nwolisa, E., Odinaka, K., & Okolo, S. (2017). Assessment of Antiretroviral Treatment Adherence among Children Attending Care at a Tertiary Hospital in Southeastern Nigeria. *Journal of Tropical Medicine*, 3605850. <http://doi.org/10.1155/2017/3605850>
- Chiegil, J.S. and Atulomah N.O. (2015). HIV-Information Comprehension, readiness to Adhere and Adherence Amongst HIV-Clinic-Attendees (non -published)
- Gielen, A.C., McDonald, E.M., Gary, T.L., and Bone, L.R. (2008). Using the PRECEDE/PROCEED Model to Apply Health Behavior Theories. In K. Glanz, F.M. B. K. Rimer, & K. Viswanath, (Eds.), *Health Behavior and Health Education: Theory, Research and Practice*. 4th edition, pp. 407–433. San Francisco: Jossey-Bass
- Green, L.W. (1974). Toward cost–benefit evaluations of health education: some concepts, methods, and examples. *Health Education Monographs*2 (Suppl. 2): 34–64.
- Glanz, K. and Rimer, B. (2005). *Theory at a Glance: A Guide for Health Promotion Practice*, 2nd Edition. Publication Number: T052. NIH Number: 05-3896. U.S. Department of Health and Human Services. National Institutes of Health. Bethesda: National Cancer Institute. Accessed on June 26, 2011 at "Archived copy" (PDF). Archived from the original (PDF) on October 16, 2011. Retrieved July 9, 2011.

- Green, L., Kreuter, M. (2005). *Health program planning: An educational and ecological approach*. 4th edition. New York, NY: McGraw-Hill
- Green, L.W. (1974). Toward cost-benefit evaluations of health education: some concepts, methods, and examples. *Health Education Monographs* 2 (Suppl. 2): 34-64.
- Green, L.W., Levine, D.M. and Deeds, S.G. (1975). Clinical trials of health education for hypertensive outpatients: design and baseline data. *Preventive Medicine* 4(4): 417-25
- Green, L.W., Kreuter, M.W., Deeds, S.G., Partridge, K.B. (1980). *Health Education Planning: A Diagnostic Approach*. Mountain View, California: Mayfield
- Green, L.W., and Kreuter M.W. (1999). *Health Promotion Planning: An Educational and Ecological Approach*, 3rd edition. Mountain View, CA: Mayfield.
- Happy Boss (2017). The History Of HIV In Nigeria you Should Know and Statistics <https://cokoye.com/health/thehistory-of-hiv-in-nigeria-you-should-knowandstatistics/msg6395/?PHPSESSID=kr505otd5fq9jfpo1c25ha9iu3#msg6395>
- Hyle, E.P. and Dryden-Peterson (2017). The impact of antiretroviral therapy on morbidity and mortality of HIV infection in resource-limited settings <http://www.uptodate.com/contents/the-impact-of-antiretroviral-therapy-on-morbidity-and-mortality-of-hiv-infection-in-resource-limited-settings>
- Johs, N.A., Kellar-Guenther Y., Jankowski C.M., Neff H. and Erlandson K.M. (2019). A qualitative focus group study of perceived barriers and benefits to exercise by self-described exercise status among older adults living with HIV. *BMJ Open*; 9(3): e026294. doi:10.1136/bmjopen-2018026294.
- Kanu C.T., Maduka, O., Okefor, C.U. (2017). Perceived Stigma and Highly Active Antiretroviral Treatment Adherence among Persons Living with HIV/AIDS in the University of Port Harcourt Teaching Hospital *Orient Journal of Medicine*, 29(1-2) <http://www.orientjom.com/ojom2017/v29n12/7Perceived%20Stigma%20and%20HAART%20in%20PLWHA.pdf>
- Sani Aliyu, Director-General of the National Agency for the Control of AIDS, NACA, (2017). Premium Times, Nigeria: HIV/Aids - Nigeria Risks One Million Deaths in Five Years, NACA Warns <http://allafrica.com/stories/201707100021.html>
- Sapkota, S., Brien, J. E., Greenfield, J. R., & Aslani, P. (2015). A Systematic Review of Interventions Addressing Adherence to Anti-Diabetic Medications in Patients with Type 2 Diabetes Components of Interventions. *PLoS ONE*, 10(6), e0128581. <http://doi.org/10.1371/journal.pone.0128581>
- Suleiman, I.A. and Momo, A. (2016). Adherence to antiretroviral therapy and its determinants among persons living with HIV/AIDS in Bayelsa State, Nigeria, *National Institute of Health*, 14(1) doi:10.18549/Pharm Pract.2016.01.631
- Uusküla, A., Laisaar, K., Raag M., Lemsalu L., Lõhmus L., Rütel K., Amico K.R (2017). Effects of Counselling on Adherence to Antiretroviral Treatment among People with HIV in Estonia: A Randomized Controlled Trial **DOI** <https://doi.org/10.1007/s10461-017-1859-6>
- CDC, (2017). Global HIV and Tuberculosis. <https://www.cdc.gov/globalhivtb/index.html>
- Who, (2017). Global Health Observatory (GHO) data <http://www.who.int/gho/hiv/en/Who> (2017)
- Happy Boss (2017). The History Of HIV In Nigeria you Should Know and Statistics <https://cokoye.com/health/thehistory-of-hiv-in-nigeria-you-should-know-and-statistics/msg6395/?PHPSESSID=kr505otd5fq9jfpo1c25ha9iu3#msg6395>

- UNAIDS (2017). Data Book http://www.unaids.org/sites/default/files/media_asset/Data_book_2017_en.pdf 20170720_
- Sani Aliyu, Director-General of the National Agency for the Control of AIDS, NACA, (2017). Premium Times, Nigeria: HIV/Aids - Nigeria Risks One Million Deaths in Five Years, NACA Warns <http://allafrica.com/stories/201707100021.html>
- Hyle E.P. and Dryden-Peterson (2017). The impact of antiretroviral therapy on morbidity and mortality of HIV infection in resource-limited settings <http://www.uptodate.com/contents/the-impact-of-antiretroviral-therapy-on-morbidity-and-mortality-of-hiv-infection-in-resource-limited-settings>
- UNAIDS (2016). Global AIDS update: 2016. http://www.unaids.org/sites/default/files/media_asset/global-AIDS-update-2016_en.pdf (Accessed on June 22, 2016).
- Uusküla, A., Laisaar, K., Raag M., Lemsalu L., Lõhmus L., Rüütel K., Amico K.R (2017). Effects of Counselling on Adherence to Antiretroviral Treatment Among People with HIV in Estonia: A Randomized Controlled Trial **DOI** <https://doi.org/10.1007/s10461-017-1859-6>
- Kanu C.T., Maduka O., Okefor C.U. (2017). Perceived Stigma and Highly Active Antiretroviral Treatment Adherence among Persons Living with HIV/AIDS in the University of Port Harcourt Teaching Hospital *Orient Journal of Medicine*, 29(1-2) <http://www.orientjom.com/ojom2017/v29n1/2/7Perceived%20Stigma%20and%20HAART%20in%20PLWHA.pdf>
- Akahara, C., Nwolisa, E., Odinaka, K., & Okolo, S. (2017). Assessment of Antiretroviral Treatment Adherence among Children Attending Care at a Tertiary Hospital in Southeastern Nigeria. *Journal of Tropical Medicine*, 2017, 3605850. <http://doi.org/10.1155/2017/3605850>
- WHO (2017) Adherence to Long-Term Therapies - Evidence for Action <http://apps.who.int/medicinedocs/en/d/Js4883e/7.2.2.html>
- Sapkota, S., Brien, J. E., Greenfield, J. R., & Aslani, P. (2015). A Systematic Review of Interventions Addressing Adherence to Anti-Diabetic Medications in Patients with Type 2 Diabetes Components of Interventions. *PLoS ONE*, 10(6), e0128581. <http://doi.org/10.1371/journal.pone.0128581>
- Suleiman, I.A. and Momo. A. (2016). Adherence to antiretroviral therapy and its determinants among persons living with HIV/AIDS in Bayelsa State, Nigeria, *National Institute of Health*, 14(1) doi: 10.18549/PharmPract.2016.01.631