# Adherence to HAART Among HIV Patients Attending Naama Health Centre III: Prevalence and Influencing Factors

## Namuli Joyce

**Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda.**

## ABSTRACT

Uganda is making significant progress towards achieving the 1st 90:90:90 target, with 89% of HIV patients aware of their status, 94% on HIV treatment, and 90% virally suppressed. A study at Naama Health Centre III found that adherence to HAART among HIV patients was 87.8%, slightly lower than the UNAIDS recommendation of 90%. Factors influencing adherence include post-primary education, age over 35, failure to disclose HIV status to a close relative, and development of drug side effects. The study recommends the government to conduct mass sensitization campaigns on public media, counselors to emphasize adherence during Randomized Controlled Trials (RCT) sessions, and patients to disclose their HIV status to a close family to minimize HIV-related stigma. The study also suggests that the government should conduct mass media campaigns to increase awareness of HAART adherence, and counsellors should emphasize the importance of adherence during RCT sessions.
**Keywords:** HIV treatment, HAART, HIV patients, HIV status, HIV-related stigma. Introduction.

## INTRODUCTION

After its identification in 1981 as a novel distinct immunodeficiency syndrome ("acquired" rather than "primary"), characterized by a depletion of CD4+ T cells and an expansion of activated CD8+ T cells, in 1983 AIDS was finally associated with HIV in a causative way [1]. Globally, 38.0 million [31.6 million–44.5 million] people were living with HIV in 2019 and 20.7 million [18.4 million–23.0 million] of these were from Southern and Eastern Africa, [2]. 1.7 million [1.2 million–2.2 million] people became newly infected with HIV in 2019, 690 000 [500 000–970 000] people died from AIDS-related illnesses in 2019 and 75.7 million [55.9 million–100 million] people have become infected with HIV since the start of the epidemic [3]. [4]. In 2014, the Joint United Nations Programme on HIV/AIDS (UNAIDS) set a 90-90-90 target for 2020. If this target was met, 90% of people living with HIV would know their HIV status; 90% of all people diagnosed with HIV would be receiving antiretroviral therapy (ART) and

90% of all people on ART would be virally suppressed [5]. Improved coverage and use of highly active antiretroviral treatment (HAART) has reduced morbidity and mortality in both children and adults with HIV and AIDS, with integrated approaches used to improve care and outcomes [6]. Improved care and an appreciable increase in access to HAART for people living with HIV and AIDS (PLWHA) have resulted in a 48% reduction in AIDS-related deaths since 2003, with the epidemic now declining [7]. In Uganda today, the total number of People Living with HIV (PLHIV) was 1,460,000 as of December 2019 [8]. According to the Ministry of Health estimates 2019, the HIV prevalence among adults (15-49 years) in Uganda was 5.6%. The HIV prevalence in Uganda varies from district to district. The district with the highest HIV prevalence was Kalangala (18.0%) while Nabilatuk District had the lowest prevalence (0.2%) in the country [9]. Uganda is among the 14 countries globally

to attain the 2nd and 3rd 90:90:90 targets. Significant progress is being made towards achieving the 1st 90 target. With 89% aware of their status,94% on HIV treatment and 90 % virally suppressed [8]. The UK met these targets, Botswana and Australia are on track while Canada is also on track to meet these targets, with 87% of people with HIV diagnosed, 82% on treatment and 93% virally suppressed [10]. Today, of the 38 million people living with HIV, 26 million people are now on treatment. That means 12 million people are still waiting. This shows that 67% [54–79%] of all people living with HIV were accessing treatment which is way below the 90% target ee . Maintaining high levels of adherence is a challenge across settings [11]. However, it has been noted that there is a clear relationship between adherence to ARV treatment, viral load suppression, acquired drug resistance and treatment failure. In the long term, non-adherent patients on tri-therapy are more likely to die than adherent patients on the same therapy [11]. Suboptimal adherence to antiretroviral medication has been reported for specific patient groups such as adolescents, pregnant women, and others in high-, middle-, and low-income countries. A broad range of context-specific barriers to adherence have been reported, including forgetfulness, stigma, adverse drug reactions, and competing responsibilities. These challenges have been categorized as individual, interpersonal, community, and structural factors [12]. Poor adherence to ART regimens results in incomplete suppression of HIV replication and the emergence of resistance to ART that increases the potential for treatment failure, compromising future treatment options and leading to increased risk of mortality [1]. Furthermore, children and adolescents with HIV often face other life stressors that affect their ability to achieve optimum adherence, including parental HIV disease, poverty, and limited or inconsistent social support. Availability of adherence information assists healthcare workers in providing optimal care to patients [13].

## Statement of Problem

HIV and AIDS have a devastating impact on morbidity and mortality across countries, with sub-Saharan Africa having the highest prevalence rates. Currently, 38 million people worldwide are living with HIV and AIDS, with 20.7 million people living in East and Southern Africa and with 72% [62–81%] accessing treatment [4]. According to WHO, only 15.0 million [14.4 million– 15.1 million] of the 20.7 million were accessing treatment. In Uganda, 94% of those diagnosed with HIV are on HIV treatment [8]. Non-adherence is the most common reason for treatment failure, with the potential risk of developing drug resistance through suboptimal viral suppression. Subsequent transmission of first-line ART-resistant HIV strains increases demand for second-line treatment often associated with poorer patient health outcomes and increasing healthcare costs [14]. Although the antiretroviral treatment (ART) has improved the lives of people in SSA there is yet a substantial percentage, sometimes as high as 60% of people living with HIV (PLWH) are not on ART [15]. This has propagated the negative outcomes of longer-term suboptimal adherence that include increased risk of disease progression, drug resistance, high viral load and consequent risk of transmission and death [10]. Data about HAART adherence in Uganda is scanty but it is no stranger to the shortfalls in HIV testing, access to ART and long-term retention in care hence necessitating this study to determine factors influencing adherence to HAART among HIV patients among HIV patients attending Naama Health Centre III.

## METHODOLOGY

### Study design

The study adopted a cross-sectional hospital-based survey. The cross-sectional study design entailed the collection of information on the individual study parameters at a single point in time. It provides a basis for describing the status of phenomena at a

Namuli
fixed point in time and does not allow for inference of changes and trends of the same over time.

## Area of Study

Naama Health Centre III Mityana municipality, Mityana district. The health centre supplies people mainly from the Mityana district and surrounding areas. Mityana town is in the central region of Uganda and is the main municipal and administrative centre for the Mityana district. It is located approximately 70 kilometres by road west of Kampala, Mityana is halfway between Kampala and Mubende, (approximately 80km east of Mubende town). The geographical coordinates are $0^0 23``58.0$" N, $32^0 02``36.0$" E. In 2020 the UBOS estimated the midyear population of the town to be 105,200 and the population calculated the annual population growth to be at 1.68 between 2014 and 2020.

## Study population

HIV patients attending ART clinic and taking antiretroviral therapy at Naama Health Centre III in Mityana municipality, Mityana district.

## Inclusion criteria

All patients attending ART clinic who are consenting to participate in the study. Patients with sound mind.

## Exclusion criteria

Voluntary withdraw from the study.
Patients who didn't consented to participate in the study. Very sick patients.

## Sample size determination

The sample size was calculated using the probability sampling formula by (Fischer et al, 1991) i.e.

$N = Z^2 pq/d^2$

Where, n = sample size, when the population size is greater than 10,000.

z = Standard normal deviation, i.e. 1.96, set at 95% confidence level.

p = 87.1 % [16].
q = 1- p= expected non-prevalence d = Desired degree of accuracy
If the value of p = 0.871 n = $z^2$ p (1- p) / $d^2$
= $1.96^2 \times 0.871(1- 0.871) / 0.05^2$
= 3.8416×0.112/ 0.0025
**= 172**

## Sampling procedures

A consecutive sampling technique was used to sample the study participants whereby a patient coming in and meeting the inclusion criteria was enrolled into the study.

## Data collection methods and management

Primary data was obtained using a structured questionnaire administered in English and Luganda languages. The investigator introduced herself to the prospective participants and read to individual participants the consent form, the title and the purpose of the study as well as the rights of the participants throughout the study. Patients at the ART clinic who consented to participate in the study were given questionnaires to fill out on their own so that they could answer the questions privately and therefore feel secure in terms of confidentiality. The investigator recorded all the questionnaire serial numbers. This was done to ensure data quality as the data was entered in the coding box.

## Data analysis

Analyzed data was presented in tables and figures showing frequencies and proportions. Analysis was done for continuous variables to report measures of central tendency like mean, median and mode and measures of dispersion like the range, interquartile range and measures of variance like standard deviation for various independent variables. For categorical variables, data presentation was through well summarized "2 by 2" tables that show frequencies (percentages) and totals. For continuous and categorical data, bar graphs, histogram, pie charts was used where suited to present the data.

Data was analysed using STATA version 11. Analysis of data was by simple linear and logistic regression as well as multiple linear and logistic analyses for continuous and categorical variables respectively. The level of significance was present at 5%. Odds Ratios (ORs) with their respective 95% confidence intervals were used to assess for statistical associations and p-values of less than 0.05 were

considered statistically significant.

### Quality control

To ensure quality work, the inclusion and exclusion criteria were strictly adhered to and data forms were double-checked for completeness by the principal investigator.

### Ethical considerations

The permission to conduct this study was sought from Kampala International University Research Ethics Committee, Institution Review Committee and Naama HC. The study was granted an ethical clearance certificate. Participants enrolled in the study first consented after a thorough explanation of the purpose of the study, the risks involved and the use of data to be collected. Numbers instead of names were used in all the questionnaires and laboratory forms.

## RESULTS
### Adherence to HAART
**Table 1: showing adherence to HAART among patients at one month**

| Adherence assessment in a month | Frequency | Percentage |
|---|---|---|
| Taken drugs for 27 or more days | 151 | 87.8 |
| Taken drugs for less than 27 days | 21 | 12.2 |
| Total | 172 | 100.0 |

From Table One, at least 21(12.2%) of the participants took their HAART treatment for less than 27 days making them fail to reach a 90% adherence, while 151(87.8%) took their HAART treatment for 27 or more days.

### Reasons for missing HAART
**Table 2: shows reasons for missed HAART treatments among patients**

| Reasons for poor adherence | Frequency | Percentage |
|---|---|---|
| Being away from home | 13 | 61.9 |
| Forgetfulness | 06 | 28.6 |
| Lack of privacy | 02 | 9.5 |
| Total | 21 | 100.0 |

From Table 2 above, the majority 13(61.9%) of the patients missed their treatments because of not being home, at least 6(28.6%) forgot while 2(9.5%) lacked privacy for taking their treatment.

## Social demographic characteristics and HAART adherence

**Table 3: shows an association between social demographic factors and HAART adherence.**

| Demographic factor | Good adherence (90% at one month) | | Poor adherence (less than 90%) | | Odds ratio (95%CI) | P-value <0.05sigf |
|---|---|---|---|---|---|---|
| | Freq. | per cent | Freq. | per cent | | |
| **AGE** | | | | | | |
| 18 - 35 | 44 | 29.1 | 17 | 81.0 | ref | |
| More than 35 | 107 | 70.9 | 04 | 19.0 | 0.6(0.25-8.15) | 0.003 |
| **GENDER** | | | | | | |
| Male | 68 | 45.0 | 08 | 38.1 | ref | |
| Female | 83 | 55.0 | 13 | 61.9 | 0.3(0.16-4.13) | 0.204 |
| **EDUCATION** | | | | | | |
| Primary | 74 | 49.0 | 12 | 57.1 | ref | |
| Post-primary | 77 | 51.0 | 9 | 42.9 | 0.4(0.1-7.27) | 0.006 |
| **OCCUPATION** | | | | | | |
| Formally Employed | 33 | 21.9 | 2 | 9.5 | ref | |
| Peasant | 118 | 78.1 | 19 | 90.5 | 0.2(0.05-9.81) | 0.278 |

Note: HAART* refers to Highly Active Antiretroviral Therapy.

From Table 3 above, the participants were assessed for the association between demographics and HAART adherence, the majority 107(70.9%) of participants who had a good adherence were more than 35 years of age, while 17(81.0%) of those with poor adherence were between 18 to 35 years, there was a significant correlation between patients' age and HAART adherence with an odds ratio of 0.6(0.25-8.15 and a p-value of 0.003. From the study, the majority of the participants were females, of which 83(55.0%) had good adherence while only 68(45.0%), 13(61.9%) women and 8(38.1%) had poor HAART adherence, there was no significant correlation between gender and HAART adherence. The participants were assessed for their education level, majority of the participants 77(51.0%) who had good adherence had a post-primary education level, while the majority 12(57.1%) of those with poor adherence had a primary level of education, the level of education was significantly associated with HAART adherence at an odds ratio of 0.4(0.1-7.27) and value of 0.006. The majority of the participants both with good or poor adherence 118(78.1%) and 19(90.5%) were peasant farmers, one's occupation was not a significant factor in influencing HAART adherence.

## Patient factors and HAART adherence

**Table 4: shows the relation between patient factors and adherence**

| Factor | Good adherence $n_1=151$ | | Poor adherence; $n_2=21$ | | Odds Ratio | p-value |
|---|---|---|---|---|---|---|
| Response | Freq. | Per cent | Freq. | Per cent | (95% CI) | **<0.05sgnf** |
| **Taking HAART needs food plenty** | | | | | | |
| True | 137 | 90.7 | 18 | 85.7 | Ref | |
| False | 14 | 9.3 | 03 | 14.3 | 0.70(0.55-4.75) | **0.067** |
| **Patients who disclosed HIV status** | | | | | | |
| Yes | 140 | 92.7 | 09 | 42.9 | Ref | |
| No | 11 | 7.3 | 12 | 57.1 | 0.27(0.01-7.84) | **0.005** |
| **Experiencing HAART side effects** | | | | | | |
| True | 41 | 27.2 | 11 | 52.4 | Ref | |
| False | 110 | 72.8 | 10 | 47.6 | 0.14(0.02-5.59) | **0.045** |
| **Associated substance abuse** | | | | | | |
| Yes | 28 | 18.5 | 04 | 19.0 | Ref | |
| **No** | **123** | **81.5** | **17** | **81.0** | **0.58(0.17-9.77)** | **0.098** |

From the table 4 above, the participants were asked if taking HAART had any correlation with altered their food need, majority of the participants both with good and poor adherence said agreed that they had to alter their feeding habits after being initiated on ART with an odds ratio of 0.70(0.55-4.75) and there there was no significant relationship between adherence to HAART and food intake requirements. The study also found out that patients 140(92.7%) who had disclosed their HIV status to close persons to them had a better HAART adherence than those 12(57.1%) who had not disclosed their HIV status to their close relative, Patients' disclosure of their HIV status was significantly associated with good adherence at an odds ratio of 0.27(0.01-7.84), CI;95% and P-value 0.005.

The study also found out that the majority of the patients 11(52.4%) who had poor adherence had experienced drug side effects, while the majority of those with good adherence had not experienced the side effects, the study showed that the presence of side effects on a patient was significantly associated with poor HAART adherence at a confidence interval of 95%, the odds ratio of 0.14(0.02-5.59 and a p-value of 0.045. The participants were also asked if they were using any other drug for their psychological comfort such as alcohol, smoking, marijuana or cocaine, and the majority of the patients both good 123(81.5%) adherence and those with poor 17(81.0%) adherence said they were not using drugs of abuse, there was no association between substance abuse and HAART adherence.

## DISCUSSION

### Adherence to HAART

From the study, at least 21(12.2%) of the participants took their HAART treatment for less than 27 days making them fail to reach a 90% adherence, while 151(87.8%) took their HAART treatment for 27 or more days, and majority 13(61.9%) of the patients missed their treatments for not being home, at least 6(28.6%) forgot while 2(9.5%) lacked privacy for taking their treatment, this could be because some of the patients are not sensitized enough to ensured continued taking of their HAART for viral load suppression when this study is compared with other studies, it shows a difference from UNSAID recommendation

which in 2014 emphasized a 90-90-90 target in which If this target was met, 90% of people living with HIV would know their HIV status; 90% of all people diagnosed with HIV would be receiving antiretroviral therapy (ART) and 90% of all people on ART would be virally suppressed.

**Social demographic characteristics and HAART adherence**

The majority 107(70.9%) of participants who had a good adherence were more than 35 years of age, while 17(81.0%) of those with poor adherence were between 18 to 35 years, there was a significant correlation between patients age and HAART adherence with an odds ratio of 0.6(0.25-8.15 and a p-value of 0.003, this could be because most of the patients who are below 35 years have a lot to engage them in their youthful daily activities and they can easily forget taking treatment, also most of them could have been newly diagnosed and have not yet appreciated the benefits of adherence to treatment, when compared with other studies, this study shows a correlation with a study by [13] which indicated that patients who were 35 years and above were more likely utilizing HIV services with confidence as a result of counseling from health workers as compared to those below 25 years, on a different comparison another study by [17] study on the use of formal and informal services for HIV care and TB treatment in rural Uganda however indicated that old age was a principal hindrance to utilization of HIV-related services during pregnancy. From the study, the majority of the participants were females, of which 83(55.0%) had good adherence while only 68(45.0%), 13(61.9%) women and 8(38.1%) had poor HAART adherence, there was no significant correlation between gender and HAART adherence, this could be because women have better health-seeking behaviour than their male counterparts, this makes them have increased numbers in both categories. The participants were assessed for their education level, The majority of the participants 77(51.0%) who had good adherence had a post-primary education level, while the majority 12(57.1%) of those with poor adherence had a primary level of education, the level of education was significantly associated with HAART adherence at an odds ratio of 0.4(0.1-7.27) and value of 0.006, this could be because educated patients have a higher access to information about HIV and AIDS care and can easily appreciate the importance of good adherence, as compared to those with low or no formal education, when compared with other studies, this study shows a positive correlation with a study result by [18], in which they indicated that Education provides the PLWHIV with the basis for evaluating where and when to get HIV related health care services or if they require treatment. Patients who had at least a post-primary education level were 1.5 times more likely to seek HIV care services than those who never attended formal schooling. The majority of the participants both with good or poor adherence 118(78.1%) and 19(90.5%) were peasant farmers, one‟'s occupation was not a significant factor in influencing HAART adherence, the majority of the participants were peasant farmers could be because the catchment area of the health facility is predominantly occupied by farmers, however when this study is compared with other studies, it shows a difference from a study by [19] on the effectiveness of HAART in preventing AIDS progression due to opportunistic infections in East Africa, in which they associated various peoples „occupations with correlate to seeking HIV care, with civil servants having a comparing high percentage (70%), and the least being casual workers at 4%.

**Patient factors and HAART adherence.**

the participants were asked if taking HAART had any correlation with altered their food need, majority of the participants both with good and poor adherence said agreed that they had to alter their feeding habits after being initiated on ART with an odds ratio of 0.70(0.55-4.75) and there was no significant relationship between adherence to HAART and food intake requirements, this could be because most of the patients are always encouraged to

have good nutrition after being initiated on ART, to some patients this is usually since they tend to associate it with taking treatments, this creates a risk of missing dosage if the desired food is not available, when this study is compared with other studies, this study results shows a correlation with a study by [14] to assess socio-cultural factors influencing adherence to antiretroviral therapy among people living with HIV/AIDS in a tertiary hospital in southwestern Nigeria which showed that food insecurity resulted in non-adherence through two mechanisms: stopping ART when food was unavailable to avoid aggravated (gastrointestinal) side effects, or because taking ART when insufficient food is available increased hunger. The study also found out that patients 140(92.7%) who had disclosed their HIV status to close persons to them had a better HAART adherence than those 12(57.1%) who had not disclosed their HIV status to their close relative, patients disclosure of their HIV status was significantly associated with good adherence at odds ratio of 0.27(0.01-7.84), CI; 95% and P-value 0.005, HIV disclosure helps a patient to have social social support and to be reminded to take their treatments and reduce HIV associated stigma, this helps them to have a good adherence rate, when this study is compared with other studies, it shows a shows a relative similar trend with study results from [20] in a Cross-Sectional analysis to determine factors influencing adherence to HAART among HIV patients among patients living with HIV infection in Southwest Nigeria which showed that stigmatization of HIV/AIDS patients by the society contributes to nondrug adherence as some patients felt embarrassed while taking their medical folders to pharmacy for prescription refill, despite these folders were similar to other patients. The study also found out that the majority of the patients 11(52.4%) who had poor adherence had experienced drug side effects, while the majority of those with good adherence had not experienced the side effects, the study showed that the presence of side effects on a patient was significantly associated with poor HAART adherence at confidence interval of 95%, odds ratio of 0.14(0.02-5.59 and p-value of 0.045, ART is usually associated with mild side effects such as headache, nausea and mild skin reactions, others experience bizarre side effects such as hallucinations, severe skin reactions and this hinders patients from effectively taking ART, when compared with other studies, this study shows a difference from a study by [21] in their study in which they revealed that revealed that drug adverse effect showed no significant association with adherence in both bivariate and multivariate logistic regression, this may be because of overlapping of symptoms of HIV/AIDS and adverse effects of HAART. The participants were also asked if they were using any other drug for their psychological comfort such as alcohol, smoking, marijuana or cocaine, and the majority of the patients both good 123(81.5%) adherence and those with poor 17(81.0%) adherence said they were not using drugs of abuse, there was no association between substance abuse and HAART adherence, HIV is fond of using drugs of abuse for psychological relief, this can greatly affect their adherence to ART since some of them forget especially if they become drank when compared with other studies, this shows a similar trend with study results by [22-26] in Botswana in which nearly 40 per cent of the patients surveyed admitted missing a dose because of alcohol consumption relatedly [14]. Alcohol use increases the risk of non-adherence to ARV because the patients may forget to take their medication as a consequence of alcohol use. Men may use alcohol to deny the reality of being HIV-positive [22-26].

## CONCLUSION

The patients had an adherence of 87.8% which was slightly lower than the UNAIDS recommendation of 90%. Post-primary education and age of more than 35 years were significantly associated with good adherence, while failure to disclose HIV status and drug side effects contributed to poor adherence.

## Recommendation

- The government should continue mass sensitization campaigns on public mass media to emphasize- the importance of adherence.
- Patients should be encouraged to disclose their HIV status to a close family as a way of minimizing HIV-related stigma.

## REFERENCES

1. Afe, A., Olanrewaju, M. and Gbadebo, O. (2017). Factors Influencing Adherence to HAART among HIV patients among Patients Living with HIV Infection in Southwest Nigeria: A Cross-Sectional Analysis. Journal of HIV & Retro Virus 3:6.

2. WHO, *Tool to Set and Monitor Targets for HIV Prevention, Diagnosis, Treatment and Care for Key Populations: Supplement to the 2014 Consolidated Guidelines for HIV Prevention, Diagnosis, Treatment and Care for Key Populations*, World Health Organization, Geneva, Switzerland, 2015.

3. Reda, A. A., and Sibhatu, B. (2012). Determinants of Adherence to Antiretroviral Therapy among HIV-Infected Patients in Africa. AIDS Research and Treatment, 574656.

4. Mbuagbaw, L. et al. (2020). Overview of systematic reviews on strategies to improve treatment initiation, adherence to antiretroviral therapy and retention in care for people living with HIV: part 1. BMJ Open 10(9): e034793.

5. Geocze, L. et al. (2010). Quality of life and adherence to HAART among HIV patients in HIV-infected patients. Revista de saúde pública 44:743-9.

6. Meena, L. P. et al. (2014). Study the drug adherence and possible factors influencing drug adherence in HIV/AIDS patients in northeastern part of India. Journal of education and health promotion 3:31-31.

7. Lokpo, S. Y., Ofori-Attah, P. J., Ameke, L. S., Obirikorang, C., Orish, V. N., Kpene, G. E. and Tetteh, Q. S. (2020). Viral suppression and its associated factors in HIV patients on highly active antiretroviral therapy (HAART): a retrospective study in the HO municipality, Ghana. AIDS Research and Treatment, 2020, 1-7.

8. Chirambo, L. et al. (2019). Factors influencing adherence to antiretroviral treatment among adults accessing care from private health facilities in Malawi. BMC Public Health 19(1):1382.

9. Federal HIV/AIDS Prevention and Control Office and Federal Ministry of Health (FHAPCO). Guidelines for management of opportunistic infections and antiretroviral treatment in adolescents and adults in Ethiopia. 2008. p. 77–80: http://www.who.int/hiv/pub/guid elines/ethiopia_art.

10. Shubber, Z. et al. (2016). Patient-Reported Barriers to Adherence to Antiretroviral Therapy: A Systematic Review and Meta-Analysis. PLOS Medicine 13(11): e1002183.

11. Mbengue, M. A. et al. (2019). Prevalence and determinants of adherence to antiretroviral treatment among HIV patients on first-line regimen: a cross-sectional study in Dakar, Senegal. The Pan African Medical Journal 33:95-95.

12. Momo, K. B. et al. (2019). Barriers to and enablers of uptake of and adherence to antiretroviral therapy in the context of integrated HIV and tuberculosis treatment among adults in sub-Saharan Africa: a protocol for a systematic literature review. BMJ Open, 9(10): e031789.

13. Nyogea, D. et al. (2015). Determinants of antiretroviral adherence among HIV positive children and teenagers in rural Tanzania: a mixed methods study. BMC Infectious Diseases 15(1):28.

14. Khumalo, G. E. et al. (2020). Barriers and facilitators of rendering HIV services by community health workers in sub-Saharan Africa: a meta-synthesis protocol. BMJ Open, 10(10): e037876.

15. Neupane, S., Govinda, P. D. and Harish, C. G. (2019). Adherence to antiretroviral treatment and

associated factors among people living with HIV and AIDS in CHITWAN, Nepal. BMC Public Health 19(1):720.

16. Heestermans, T. et al. (2016). Determinants of adherence to antiretroviral therapy among HIV-positive adults in sub-Saharan Africa: a systematic review. BMJ Global Health 1(4): e000125.

17. Merinah O. et al. (2020). Characteristics of human encounters and social mixing patterns relevant to infectious diseases spread by close contact: A survey in Southwest Uganda. BMC Infectious Diseases 18.

18. Wadunde, Ignatius, et al. (2018). Factors associated with adherence to antiretroviral therapy among HIV infected children in Kabale district, Uganda: a cross sectional study. BMC Research Notes 11(1):466.

19. Charles, Asraf, et al. (2020). Knowledge, attitudes, and practices towards COVID-19 among Nepalese Residents: A quick online cross-sectional survey. Asian Journal of Medical Sciences 11:6-11.

20. Mbugane, Lorie, et al. (2020). Examining adherence barriers among women with HIV to tailor outreach for long-acting injectable antiretroviral therapy. BMC Women's Health 20(1):152.

21. Jones, Deborah, et al. (2015). Examining Adherence Among Challenging Patients in Public and Private HIV Care in Argentina. AIDS and Behavior 19(9):1619-1629.

22. Letta, Shiferaw, et al. (2015). Factors associated with adherence to Antiretroviral Therapy (ART) among adult people living with HIV and attending their clinical care, Eastern Ethiopia. BMC International Health and Human Rights 15(1):33.

23. Emmanuel Ifeanyi Obeagu, Getrude Uzoma Obeagu and Ugwu Okechukwu Paul-Chima (2023). Stigma Associated With HIV/AIDS: A Review. NEWPORT INTERNATIONAL JOURNAL OF PUBLIC HEALTH AND PHARMACY (NIJPP) 3(2):64-67.

24. Esther Ugo Alum, Emmanuel Ifeanyi Obeagu, Okechukwu P. C. Ugwu, Patrick Maduabuchi Aja, and Michael Ben Okon (2023). HIV Infection and Cardiovascular Diseases; The Obnoxious Duos. NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES (NIJRMS) 3 (2):95-99.

25. Esther Ugo Alum, Okechukwu P. C. Ugwu, Emmanuel Ifeanyi Obeagu and Michael Ben Okon (2023). Curtailing HIV/AIDS Spread: Impact of Religious Leaders. NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES (NIJRMS) 3(2): 28-31.

26. Emmanuel Ifeanyi Obeagu, Stella Malot, Getrude Uzoma Obeagu and Okechukwu Paul-Chima Ugwu (2023).HIV resistance in patients with Sickle Cell Anaemia. NEWPORT INTERNATIONAL JOURNAL OF SCIENTIFIC AND EXPERIMENTAL SCIENCES (NIJSES) 3 (2):56-59.