FACTORS ASSOCIATED WITH ADHERENCE TO ANTI-RETROVIRAL THERAPY AMONG PEOPLE LIVING WITH HIV AGED 18-49 YEARS AT CMS COR-UNUM KIMISAGARA HC IN RWANDA

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Abstract

Based on the RPHIA conducted in 2018/2019, the viral load suppression rate in Kigali was 77.4%, ranking it as the second lowest among Rwanda's provinces. This figure falls short of the third "95" UNAIDS target which aims 95% viral loads suppression among all PLHIV on ART by 2025.The suboptimal adherence is closely linked to lower viral loads suppression rate. Despite various interventions made by the Rwanda Biomedical Centre to enhancing ART adherence, the associated factors to ART adherence remain significantly unknown, particularly at CMS Cor Unum Kimisagara Health Centre. Therefore, this study was carried out to determining the level of adherence to ART and to identifying factors associated with adherence to ART among people living with HIV at CMS Cor Unum Kimisagara HC. The study used cross-sectional study design with quantitative approach. The target population were 2087 PLHIV aged from 18 to 49 years old receiving ART at CMS Cor Unum Kimisagara HCand the sample size was 336 people, calculated by using the formula of Yamane. Data analysis and interpretation was done using descriptive statistics of frequencies, percentages, and logistic regression analysis at 95% level of significance in evaluating a significant relationship between different factors and adherence to ART.Before conducting this study, ethical clearance was obtained from Mount Kenya University, and permission was secured from CMS Cor Unum Kimisagara HC before starting collecting data. A signed consent ensured the entire voluntary participation to the study and the information obtained were kept as secret. The results show that 72.9% of participants demonstrated good adherence to their ART regimen, while 27.1% had poor adherence. The multivariate analysis showed that older age was positively significant associated with good adherence where PLHIV aged between 26-35 (AOR = 1.4295% CI: 1.10–1.85, $p = 0.007$) and 36-49 (AOR = 1.6595% CI: 1.25–2.18, $p<0.001$). Smoking and substance use (AOR = 0.62, 95% CI: 0.48–0.80, $p<0.001$), alcohol consumption (AOR = 0.71, 95% CI: 0.56–0.91, $p= 0.006$), stigma and discriminationAOR = 0.58, 95% CI: 0.45–0.75, $p< 0.001$), sadness (AOR = 0.66, 95% CI: 0.51–0.86, $p=0.002$), having side effected to ARTs (AOR = 0.73, 95% CI: 0.57–0.94, $p = 0.015$) emerged as barriers reducing odds of good adherence to ARTs whereas factors such as strong family support for taking ARTs(AOR = 2.21, 95% CI: 1.63–2.76, $p<0.001$), disclosure of HIV status(AOR = 1.89, 95% CI: 1.45–2.47, $p< 0.001$), permanent availability of ARTs (AOR = 1.41, 95% CI: 1.09–1.83, P = 0.009), regularly counselling on ARTs(AOR = 1.67, 95% CI: 1.29–2.17, P<0.001), excellent relationship with health care providers(AOR = 2.03, 95% CI:1.52-2.71,P<0.001) and excellent satisfaction with quality of health services(AOR = 2.34, 95% CI: 1.72-3.18$p<0.001$), emerged as facilitating factors improving good adherence to ARTs. In conclusion, this study revealed a relatively high level of ART adherence among people living with HIV and significant associations observed between adherence and factors such as age, smoking and substance use, alcohol consumption, ART side effects, disclosure of HIV status, family support and regularly counseling on ARTs. The study recommends enhancing patient-

centered counseling services, with a focus on regular follow-up, side effect management, and substance use screening for enhancing good adherence to ARTs among PLHIV.

Key words: Anti-retroviral Therapy,Adherence to ART, Level of adherence to ART,Poor adherence and good adherence to ART.Kimisagara health Centre, Rwanda

Introduction

Globally, adherence to Anti-Retroviral Therapy (ART) is essential for enhancing the health outcomes forpeople living with HIV by reducing viral load, preventing HIV transmission, and curbing the development of drug resistance(WHO, 2024b). The World Health Organization recommends that individuals on ART should achieve at least 95% adherence to maximize the treatment's effectiveness(Tariku et al., 2023). However, non-adherence remains a significant challenge across regions, with an estimated 40% of people on ART failing to meet the required adherence threshold(WHO, 2024a). A meta-analysis reported that the average global adherence rate is about 62%, with barriers such as forgetfulness, lack of access to medications and stigma(Woolf-King et al., 2022).

On contrary, several factors positively influence ART adherence globally, such as robust social support, comprehensive counseling, and patient-centered healthcare systems. Studies indicate that patients who are part of strong support networks, receive adequate counseling, and have consistent healthcare access are more likely to adhere to their ART regimens(Amico et al., 2019). Additionally, innovations like short message service (SMS) reminders and treatment buddies (individuals who support the patients, especially those who livewith chronic conditions like HIV/AIDS in adhering to their treatment regimen) have shown significant success in improving adherence rates, particularly in the limited resource's settings(Haberer et al., 2017).

In developed countries such as the United States, the United Kingdom, and other Western European nations, ART adherence rates tend to be higher than in low and middle income countries (LMICs)(Feelemyer et al., 2015). This is primarily due to better healthcare infrastructure, access to advanced medical care, and social support systems(Mate et al., 2023). North American studies indicate adherence rates ranging between 70% and 80%(A. Ahmed et al., 2022). However, challenges such as financial constraints; lack of family support; forgetting or delay to take ART drugs; mental disorders; substance abuse; social stigma and developing

side effects to ARTs as well as inconsistent healthcare engagement still affect adherence(Hlophe et al., 2023). Factors associated with improved adherence in developed countries include access to specialized care, mental health support, and integrated treatment programs for substance abuse(A. Ahmed et al., 2022). Furthermore, patients in developed countries benefit from advanced health technologies, such as digital health monitoring, which helps track adherence and provide timely interventions.

In low/middle income countries, adherence to ART is lower, with substantial variability depending on geographical and socio-economic contexts(Feelemyer et al., 2015). WHO notes that LMICs account for more than 70% of the global burden of HIV, with barriers such as poverty, inadequate healthcare services, and stigma leading to poor adherence(WHO, 2024a). A systematic review by Vreemanfound that adherence rates in LMICs ranged from 56% to 78%(Vreeman et al., 2014). Positive factors that promote adherence in LMICs include access to free or subsidized ART, community-based adherence support programs, and simplified ART regimens(Buh et al., 2023). Peer support groups and community health worker interventions have also been shown to improve adherence in resource-limited settings by providing ongoing support and monitoring(Haberer et al., 2017).

Africa, particularly Sub-Saharan Africa, remains the epicenter of the HIV epidemic with approximately 25.7 millionsof people living with HIV (UNAIDS, 2024). While ART coverage has improved significantly, adherence to ART remains a critical issue(Saberi et al., 2021).Studies indicate that adherence level in Sub Saharan Africa range from 58% to 80%, with significant regional variation(Almeida et al., 2024). Factors negatively affecting adherence in Africa include long distances to healthcare facilities, cultural beliefs, and stigma associated with being HIV positive(Papus et al., 2022). However, positive factors have also been observed, such as the role of family and community support in promoting ART adherence(Nachega et al., 2023). Moreover, the use of community-based ART distribution models has greatly improved adherence rates by reducing the burden of travel to distant health facilities(Strauss et al., 2021). Additionally, programs such as the “Expert Patient” model, where patients under ARTs for long period serve as ART adherence mentors to newly diagnosed patients, have shown great promise in fostering adherence to ARTs(Strauss et al., 2021).

Rwanda has made remarkable progress in scaling up ART services, achieving an ART coverage rate of over 85% among PLHIV(RBC, 2023). Despite this progress, adherence to ART remains a concern. In a study conducted by Vyankandondera, approximately 76% of patients on ART in Rwanda adhered to their treatment regimen, with barriers including lack of family support, stigma, and transportation challenges(Vyankandondera et al., 2013). Positive factors associated with adherence in Rwanda include the availability of free ART services, strong political commitment, and decentralized healthcare services that bring ART closer to communities. In additional in 2008, Rwanda has implanted the peer education system which has selected and trained the peer educators for improving the adherence on ART by providing tailored counseling on adherence ; linkage and retention in HIV care and treatment service for their neighbors living with HIV and delivering ART drugs for PLHIV with disability in community(iCAP, 2022).Furthermore, Rwanda's strong focus on social and behavioral change communication (SBCC) has helped to reduce stigma and promote positive attitudes towards ART adherence(Nsanzimana et al., 2022).

At CMS Cor Unum Kimisagara Health Centre, located in a middle of slums settings with a high population density characterized by many factors affecting the adherence to ART such as poverty, drug abuse and limited social support, the level of ARTs adherence andall factors contributing to adherence in this context are not well known as there is no study conducted on that matter. Therefore, this study was conducted to find out the factors associated with adherence to Anti-retroviral therapy among people living with HIV aged between 18 and 49 years old receiving ART at CMS Cor Unum Kimisagara Health Centre and fill the existing gap.

As a problem, in Rwanda, while considerable progress has been carried out to fighting against HIV, challenges remain, particularly in achieving optimal viral load suppression among certain groups. The Rwanda Population-based HIV Impact Assessment 2018/2019 found that viral load suppression in Kigali among adult (15-49) was 77.4%, ranked as the second-lowest among Rwanda's provinces(Nsanzimana et al., 2022). Moreover, this rate is below the third ''95'' target of UNAIDS which intends to suppress viral loads up to 95% for all PLHIV under ART treatment by 2025(UNAIDS, 2024). The suboptimal adherence is most linked to lower viral load suppression(AychewLegesse& Abate Reta, 2019). This gap highlights the need for tailoring the targeted interventions to improving the adherence on ART, particularly among this vulnerable

age group. While negative factors such as stigma, lack of social support, and logistical challenges in accessing healthcare facilities contribute to non-adherence, several positive factors such as strong family support systems, community health initiatives, and peer support groups have been shown to improve ART adherence in various settings(Nsanzimana et al., 2022). However, the extent to which these factors influence adherence in Kigali's urban environment, particularly at CMS Cor Unum Kimisagara Health Centre, remains poorly understood.

Moreover, CMS Cor Unum Kimisagara Health Centre is located in city of Kigali, Nyarugenge district in Kimisagara sector, which is made up by many slums neighborhoods. It serves the slums residents who face the various slums-related challenges, including high population density, substance abuse, poverty, delinquency and homelessness, unemployment, and limited access to social support systems. These factors significantly influence ART adherence, but their impact has not been adequately explored(CMS Kimisagara HC, 2024). There is limited research on ART adherence in urban areas like Kigali, where the dynamics of adherence may differ from rural regions due to socio-economic, cultural, and healthcare access disparities. This study seeks to assess a level of adherence on ART and identifying both the negative and positive factors associated with adherence among adults aged 18 to 49 at CMS Cor Unum Kimisagara Health Centre, with the aim of providing insights to inform more effective interventions and improve treatment outcomes.

Materials and methods

Research design

In this study, the researcher used a cross-sectional research design withquantitative research approach.

Study population

This study targetedpeople living with HIV aged from 18 to 49 years old receiving ART at CMS Cor Unum Kimisagara. According to the annual report of this institution, the ARTclinic provides care and treatment services to 2087 persons aged from 18 to 49 years old(CMS Kimisagara HC, 2024).

Sample size

The sample size was determined based on the formula that was developed by Yamane. This formula is used for study with finite population(S. K. Ahmed, 2024). According to this formula, Sample size n is:

$$n=\frac{N}{1+N(e)^2}$$

in this equation, we have the following elements:

n is the size of the minimum sample

N is the total population and it is 2087people living with HIV under ART aged from 18 to 49 receiving care at CMS Cor Unum Kimisagara(CMS Kimisagara HC, 2024).

e is the margin of error, estimated at 5%.

Substituting,

$$n=\frac{2087}{1+2087(0.05)^2}=335.665460394\approx 336$$ n=336

Therefore, the sample size is composed of 336 people living with HIV under ART receiving care at CMS Cor Unum Kimisagara.

Sampling Technique

To select the participants, the researcher used systematic random sampling technique with list. The researcher divided the total population of 2087 adult individuals living with HIV and receiving ART at CMS Cor Unum Kimisagara into a sample size of 336. To determine the starting point, a random number between 1 and 6was chosen (2087/336 ≈ 6.221 (rounded to 6). Using the current list of patients provided by the institution, every 6th person following the starting point was included in the sample, ensuring that each individual could be selected with the same chance compared to others(S. K. Ahmed, 2024).

Research instruments

To collect data, the researcher used a questionnaire that was addressed to PLHIV aged between 18 to 49years old and above receiving care at CMS Cor Unum Kimisagara Health Centre(Cuneen&Tobar, 2017). It was adapted from other studies and adjusted to the present study (Mshangila et al., 2024).

Reliability and Validity

Reliability refers to the consistency of measurement results across different conditions or times. It was assessed here through a pilot study conducted at Muhima Health Centre, selected for its comparable patient population to the target site. Internal consistency of the survey was evaluated using Cronbach's alpha, yielding a strong score of 0.90, indicating reliable instrument performance in measuring constructs like ART adherence and socio-demographic factors.

Validity focuses on how well the instrument measures what it is intended to. This was ensured via a content validation process, incorporating expert review and validated through Item Content Validity Index (I-CVI) and Scale Content Validity Index (S-CVI). Six domain specialists rated the questionnaire items for relevance, with items scoring below 0.8 on I-CVI refined or eliminated. An S-CVI average score of 0.83 or above confirmed the questionnaire's validity for use in the intended research context.

Data analysis procedure

The researcher analyzed data by using SPSS, version 25. The handling of information pertaining to first objective of the study used univariate analysis to determine the level of adherence on ARTs among PLHIV aged between 18 and 49 years old at CMS Cor Unum Kimisagara.In addition, the analysis of information concerning the second, third and fourth objectives of the study, involved data analysis where bivariate and multivariate analyses helped the researcher to investigate the factors associated with adherence on ARTs among PLHIV. On this issue, bivariate and multivariate analyses of binary logistic regression were used to assess the significant factors vis-à-vis adherence to ART.The P-value significance was set at less 0.5.

Ethical consideration

Before the study commenced, ethical approval (MKU/ETHICS/04/58/2025) and an introduction letter (MKU04/PGS&R/1256/2025) were secured from Mount Kenya University. Authorization was also obtained from CMS Cor Unum Kimisagara Health Centre on April 3, 2025. Respondents participated voluntarily, with confidentiality being a top priority. A private room was provided by the health center to ensure confidential discussions around HIV/AIDS. The data

collector utilized this secure setting to protect participants' privacy. Questionnaires were securely stored during and after data entry. Participants provided informed consent through signed consent forms, confirming their voluntary involvement.

Findings

4.3Presentation findingsfor Level of adherence to ART among people living with HIV aged between 18 and 49 years old at CMS Cor Unum Kimisagara HC.

The first objective of the study was to determine the level of adherence to ART among people living with HIV aged between 18 and 49 years old receiving ARTs at CMS Cor Unum Kimisagara HC. Table 4.2 and Figure 4.1 displayed the percentage of adherence to ART among people living with HIV aged between 18 and 49 years old at CMS Cor Unum Kimisagara HC.

Table 4.2 Level of adherence to ARTs among people living with HIV aged between 18 and 49 years old at CMS Cor Unum Kimisagara HC.

Variable	Frequency	Percentage
ART missed doses in last 30 days.		
0	193	57.4
1	52	15.5
2	8	3.3
3	31	9.2
4	20	6.0
5	18	5.4
6	7	2.1
7	2	0.6
8	2	0.6
9	1	0.3
14	2	0.6
Level of Adherence to ART		
Good adherence	245	72.9
poor adherence	91	27.1

Reasons for missing or delaying for taking ART		
Forgot to take the medication	74	22.0
Lack of food	8	2.4
Not applicable	193	57.4
Side effects were too severe	1	0.3
Traveling far from home	53	15.8
ART stock-out at Health Centre	3	0.9
Depression	2	0.6
Missed last pharmacy pick up appointment	2	0.6

Source: Primary data, 2025

Table 4.2 presents the level of adherence to antiretroviral therapy (ART) among people living with HIV (PLHIV) aged 18 to 49 years old at CMS Cor-Unum Kimisagara Health Centre. The majority of participants (57.4%) reported not missing any ART doses in the last 30 days, indicating good compliance. However, a notable portion reported missing one (15.5%), with a small number missing up to 14 doses in the previous month. Overall, 72.9% of respondents demonstrated good adherence to ART as they have taken at least 95% of their daily doses of previous 30 days' prior the day of interview, while 27.1% exhibited poor adherence as they have taken less than 95% of their daily doses of previous 30 days.

When asked about reasons for missing or delaying ART doses, 22.0% cited forgetfulness as the main cause. Traveling far from home was another significant barrier, affecting 15.8% of respondents. Other less frequently reported reasons included lack of food (2.4%), side effects (0.3%), ARTs stock-outs at the health centre (0.9%), depression (0.6%), and missed pharmacy appointments (0.6%).

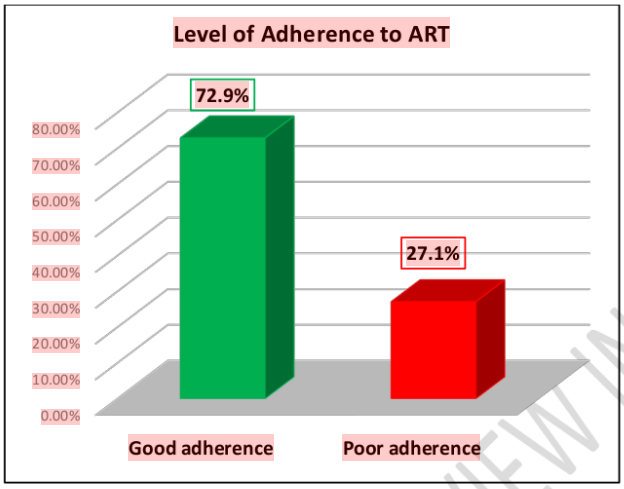

Figure 4.1 The level of adherence to ART.

Figure 4.1 illustrates the level of adherence to ARTs among people living with HIV (PLHIV) aged 18 to 49 years at CMS Cor-Unum Kimisagara Health Centre. The classification of adherence levels in this study was based on self-reported medication-taking behavior over the previous 30 days.

Good adherence was defined as taking all prescribed ART doses or missing no more than one dose in the past month, corresponding to an adherence rate of ≥95%. This level of adherence is generally considered sufficient to maintain viral suppression and minimize the risk of drug resistance(Aychew Legesse & Abate Reta, 2019).

Poor adherence, on the other hand, was defined as missing two or more doses within the same time frame, indicating an adherence rate of <95%, which scales up the risk of treatment failure

and HIV progression. These criteria are consistent with commonly accepted standards in adherence to ARTs measurement in both research settings and clinical.

4.4Presentation findingsfor Psychosocial factors associated with adherence to ART.

The second objective of the study was to psychosocial factors associated with adherence to ART among PLHIV aged between 18 and 49 years old at CMS Cor-Unum Kimisagara HC. To achieve this, the researcher conducted a bivariate analysis, which identified various factors associated with adherence to ART (Table 4).

Table 4.3 Bivariate analysis of psychosocial factors associated with adherence to ART.

Variable	Level of Adherence to ART		Chi-square test	P-value (0.05)
	Good(%)	Poor (%)		
Age (years)			**44.242**	**0.001**
18-25	34(43.6)	44(56.4)		
26-35	98(81.7)	22(18.3)		
36 - 49	113(81.9)	25(18.1)		
Gender.			**4.388**	**0.036**
Male.	98(67.1)	48(32.9)		
Female.	147(77.4)	43(22.6)		
Area of residence.			**4.405**	**0.036**
Urban.	228(74.5)	78(25.5)		
Rural.	17(56.7)	13(43.3)		
Marital status.			**44.587**	**0.001**
Single.	47(51.1)	45(48.9)		
Married.	170(85.0)	30(15.0)		
Divorced/separated	8(44.4)	10(55.6)		
widowed.	20(76.9)	6(23.1)		
Education Level			**21.04**	**0.001**
No formal education	12(44.4)	15(55.6)		
Primary	162(81.0)	38(19.0)		
Secondary	54(65.1)	29(34.9)		
University	17(65.4)	9(34.6)		

Religion			**35.467**	**0.001**
No religion	7(25.9)	20(74.1)		
Christianism	210(78.7)	57(21.3)		
Islam	28(66.7)	14(33.3)		
Occupation			7.792	0.051
Unemployed	36(60.0)	24(40.0)		
Employed	72(79.1)	19(20.9)		
Self employed	126(75.0)	42(25.0)		
Student	11(64.7)	6(35.3)		
Monthly Income			3.220	0.057
Less than 50000 rwf.	53(61.6)	33(38.4)		
50001-100000 rwf.	86(72.9)	32(27.1)		
100001- 300000 rwf.	84(80.0)	21(20.0)		
More than 300,000 Rwf	22(81.5)	5(18.5)		
Smoking/Substance use			**46.721**	**0.001**
Yes	8(23.5)	26(76.5)		
No	237(78.5)	65(21.5)		
Alcohol consumption			**89.728**	**0.001**
Yes	44(40.0)	66(60.0)		
No	201(88.9)	25(11.1)		
Disclosure of HIV status			**120.894**	**0.001**
Yes	239(84.5)	44(15.5)		
No	6(11.3)	47(88.7)		
Family support for taking ART			**169.574**	**0.001**
Yes	235(89.7)	27(10.3)		
No	10(13.5)	64(86.5)		
Perceiving stigma and discrimination			**86.652**	**0.001**
Yes	26(32.5)	54(67.5)		
No	219(85.5)	37(14.5)		
Sadness			**70.562**	**0.001**
Yes	9(20.5)	35(79.5)		
No	236(80.8)	56(19.2)		

Source: Researcher, 2025

The findings from Table 4.3 reveal significant associations between several psychosocial factors and adherence to antiretroviral therapy (ART) among people living with HIV (PLHIV) aged 18 to 49 years at CMS Cor-Unum Kimisagara Health Centre. Age was significantly associated with

ART adherence (χ^2 = 44.242, p = 0.001). Participants aged 26–35 and 36–49 showed much higher good adherence rates (81.7% and 81.9%, respectively) compared to those aged 18–25, where only 43.6% adhered well to ART.

Gender also played a significant role in adherence (χ^2 = 4.388, p = 0.036). Female participants had a higher adherence rate (77.4%) compared to males (67.1%). Area of residence showed a statistically significant association with adherence (χ^2 = 4.405, p = 0.036). Urban dwellers had a good adherence rate (74.5%) compared to those living in rural areas (56.7%).

Marital status was strongly associated with adherence (χ^2 = 44.587, p = 0.001). Married individuals had the highest good adherence rate (85.0%), while single (51.1%) and divorced/separated/widowed participants (44.4%) were less good adherent. Education level also had a significant impact on adherence (χ^2 = 21.04, p = 0.001). Participants with primary education had the highest good adherence rate (81.0%), while those with no formal education showed the lowest adherence (44.4%).

Religion was significantly associated with adherence (χ^2 = 35.467, p = 0.001). Christians had the good adherence rate (78.7%), followed by Muslims (66.7%), while those with no religious affiliation had the lowest good adherence (25.9%). While occupation did not reach conventional statistical significance (χ^2 = 7.792, p = 0.051), trends suggest that employed and self-employed individuals had good adherence (79.1% and 75.0%, respectively) than unemployed participants (60.0%) or students (64.7%). Similarly, monthly income was not significantly associated with adherence (χ^2 = 3.220, p = 0.057).

Moreover, the findings from Table 4.3 indicate that several psychological factors significantly contribute to the adherence to antiretroviral therapy (ART) among people living with HIV (PLHIV) aged between 18 and 49 years at CMS Cor-Unum Kimisagara Health Centre. Smoking

or substance use was significantly associated with lower adherence to ART (χ^2 = 46.721, p = 0.001). Only 23.5% of individuals who reported substance use had good adherence, compared to 78.5% among non-users. Similarly, alcohol consumption was strongly linked to poor adherence (χ^2 = 89.728, p = 0.001). Among alcohol consumers, 60.0% demonstrated poor adherence, while only 11.1% of non-drinkers had poor adherence.

Disclosure of HIV status showed a particularly strong association with adherence levels (χ^2 = 120.894, p = 0.001). Among those who had disclosed their HIV status, 84.5% adhered well to ART, whereas only 11.3% of non-disclosers demonstrated good adherence. Family support also emerged as a critical factor (χ^2 = 169.574, p = 0.001). Participants who received family support in taking ART had a good adherence rate of 89.7%, while only 13.5% of those lacking such support adhered well. Perceived stigma and discrimination were strongly associated with poor adherence (χ^2 = 86.652, p = 0.001). Among those who reported stigma, 67.5% were non-adherent, in contrast to only 14.5% among those who did not feel stigmatized. Finally, sadness was significantly related to poor adherence (χ^2 = 70.562, p = 0.001). Only 20.5% of those who experienced sadness adhered well to ART, compared to 80.8% of good adherence among those without sadness.

4.5 Clinical and ART medication-related factors associated with adherence to ART.

1
The fourth objective of the study was to find out clinical and ART medication-related factors associated with adherence to ART among PLHIV aged between 18 and 49 years old receiving ARTs at CMS Cor Unum Kimisagara. To achieve this, the researcher conducted a bivariate analysis, which identified various factors associated with adherence to ART. (Table 4.4).

Table 4.4 Bivariate analysis of clinical and ART medication-related factors associated with adherence to ART.

Variable	Level of Adherence to ART		Chi-square test	P-value (0.05)
	Good (%)	Poor (%)		
Side effects and tolerability of ART			**32.229**	**0.001**
Yes	20(40.0)	30(60.0)		
No	225(78.7)	61(21.3)		
Comorbidities and other health chronic conditions			**8.569**	**0.003**
Yes	26(55.3)	21(44.70		
No	219(75.8)	70(24.2)		
Complexity of ART daily dose			0.675	0.411
Simplified (eg: single pill, once daily)	232(73.4)	84(26.6)		
Complex (eg: multiple pills , twice daily)	13(65.0)	7(35.0)		
Period of time spent on ART treatment			**44.990**	**0.001**
4 – 11 months.	2(14.3)	12(85.7)		
12 – 24 months.	20(51.3)	19(48.7)		
25 – 60 months.	53(67.9)	25(32.1)		
Over 60 months.	170(82.9)	35(17.1)		

Source: Researcher, 2025

The findings from Table 4.4 reveal significant associations between several clinical and ART medication-related factors and adherence to ARTs among PLHIV aged 18 to 49 years at CMS Cor-Unum Kimisagara Health Centre.

Firstly, the presence or absence of side effects played a significant role in adherence (χ^2 = 32.229, p = 0.001). Among participants who reported no side effects, 78.7% demonstrated good adherence to ART, while only 40.0% of those who experienced side effects adhered well.

Additionally, specific ART-related side effects showed varying impacts on adherence (χ^2 = 45.550, p = 0.001). For instance, individuals who experienced dizziness, skin itching, or sleeping difficulties had notably lower adherence rates, with some symptoms such as skin itching and sleep difficulty associated with 100% poor adherence. In contrast, some side effects like nausea, vomiting, and epigastric pain were reported only among adherent participants, although the sample sizes were small.

The presence of comorbidities and other chronic health conditions was significantly associated with ART adherence (χ^2 = 8.569, p = 0.003). Participants without comorbidities had a higher adherence rate (75.8%) compared to those with comorbidities (55.3%). When analyzing specific conditions (χ^2 = 20.181, p = 0.028), mental disorders and urinary incontinence were particularly linked to poor adherence, with 100% of affected individuals showing poor adherence. Conversely, conditions like acute renal failure and physical disability appeared to have less impact, with most individuals still adhering well.

The complexity of the ART regimen did not show a statistically significant association with adherence (χ^2 = 0.675, p = 0.411). However, the duration of time spent on ART treatment showed a strong and significant association with adherence (χ^2 = 44.990, p = 0.001). The longer period on ARTs, the better adherence rates. Only 14.3% of those on ART for 4–11 months adhered well, whereas 82.9% of participants on ART for over 60 months demonstrated good adherence.

4.6 Health services-related factors associated with adherence to ART.

1

The fifth objective of the study was to assess health services-related factors associated with adherence to ART among PLHIV aged between 18 and 49 years old receiving ARTs at CMS Cor

Unum Kimisagara. To achieve this, the researcher conducted a bivariate analysis, which identified various factor associated with adherence on ARTs.

Table 4.5 Bivariate analysis of health services – related factors associated with adherence to ART

Variable	Level of adherence to ART		Chi-square test	P –value (0.05)
	Good (%)	Poor (%)		
Availability of ART drugs at health facility.			**23.459**	**0.001**
Yes	244(75.1)	81(24.9)		
No	1(9.1)	10(90.9)		
Relationship with health care proviers.			**14.660**	**0.002**
Excellent	139(80.8)	33(19.2)		
Good	96(67.1)	47(32.9)		
Fair	10(47.6)	11(52.4)		
Counseling on adherence to ART			**46.383**	**0.001**
Yes	226(80.1)	56(19.9)		
No	19(35.2)	35(64.8)		
Accessibility of CMS Cor Unum Kimisagara HC for patients			**7.794**	**0.049**
Less than 1 km	97(79.5)	25(20.5)		
1-5km.	106(73.1)	39(26.9)		
>5-10km.	24(60.0)	16(40.0)		
Over 10km.	18(62.1)	11(37.9)		
Satisfaction with Healthcare services			**59.057**	**0.001**
Very satisfied	131(89.1)	16(10.9)		
Satisfied	104(67.5)	50(32.5)		
Neutral	8(25.0)	24(75.0)		
Dissatisfied	2(66.7)	1(33.3)		

Source: Researcher, 2025

The bivariate analysis presented in Table 4.5 highlights significant associations between various health services – related factors and adherence on ARTs among people living with HIV aged between 18 and 49 years old at CMS Cor-Unum Kimisagara HC. The availability of ARTs drugs at health facility was strongly associated with good adherence to ART ($\chi^2 = 23.459$, $p = 0.001$). Among participants who reported ART availability, 75.1% demonstrated good adherence compared to only 9.1% among those who did not.

Similarly, the relationship between healthcare providers and patients was significantly associated with adherence levels ($\chi^2 = 14.660$, $p = 0.002$). PLHIV who reported having an excellent relationship with their providers had a higher adherence rate (80.8%) than those who described the relationship as fair (47.6%). Counseling on ART adherence also emerged as a significant factor ($\chi^2 = 46.383$, $p = 0.001$). Participants who received counseling showed a substantially higher adherence rate (80.1%) compared to those who did not (35.2%).

Accessibility to the health facility influenced adherence as well ($\chi^2 = 7.794$, $p = 0.049$). Those living less than 1 km from the facility had better adherence (79.5%) compared to those living over 10 km away (62.1%). Finally, satisfaction with healthcare services was highly associated with adherence to ART ($\chi^2 = 59.057$, $p = 0.001$). Among those who reported being very satisfied, 89.1% adhered well to ART, while only 25% of those who felt neutral toward the services adhered.

Table 4.6 Multivariate analysis of factors associated with adherence to ART.

Particulars	**AOR**	**95% C.I**		**P-value (0.05)**
		Lower	Upper	
Age (years)				

18-25	Ref.			
26-35	1.42	1.10	1.83	**0.007**
36 – 49	1.65	1.25	2.18	**0.001**
Gender.				
Male.	Ref.			
Female.	1.12	0.89	1.41	0.32
Area of residence.				
Urban.	1.09	0.85	1.41	0.49
Rural.	Ref.			
Marital status.				
Single.	Ref.			
Married.	1.31	1.02	1.69	**0.035**
Divorced/separated	1.18	0.87	1.60	0.29
widowed.	1.25	0.91	1.72	0.16
Educational level.				
No formal education.	Ref.			
Primary.	1.21	0.95	1.54	0.11
Secondary.	1.78	1.35	2.34	**<0.001**
University.	2.21	1.52	3.21	**<0.001**
Religion.				
No religion	Ref.			
Christianism	0.88	0.66	1.17	0.381
Islam	0.94	0.72	1.23	0.065
Smoking/Substance use				
Yes	0.62	0.48	0.80	**0.006**
No	Ref			
Alcohol consumption				
Yes	0.71	0.56	0.91	**<0.001**
No	Ref			
Disclosure of HIV status				
Yes	1.89	1.45	2.47	**<0.001**
No	Ref.			
Family support for taking ART				
Yes	2.21	1.63	2.76	**<0.001**
No	Ref.			
Perceiving stigma and discrimination				
Yes	0.58	0.45	0.75	**<0.001**

No	Ref			
Sadness				
Yes	0.66	0.51	0.86	**0.002**
No	Ref			
Side effects and tolerability of ART				
Yes	0.73	0.57	0.94	**0.015**
No	Ref			
Comorbidities and other health chronic conditions				
Yes	0.81	0.63	1.05	0.11
No	Ref			
Period of time spent on ART treatment				
4 -11 months	Ref.			
12 – 24 months	1.28	1.01	1.63	**0.04**
25 – 60 months	1.68	1.29	2.19	**<0.001**
Over 60 months	1.94	1.48	2.54	**<0.001**
Availability of ART drugs at health facility				
Yes	1.41	1.09	1.83	**0.009**
No	Ref.			
Relationship with Health care providers				
Excellent	2.03	1.52	2.71	**<0.001**
Good	1.52	1.17	1.98	**0.002**
Fair	Ref.			
Counseling on adherence to ART				
Yes	1.67	1.29	2.17	**<0.001**
No	Ref.			
Accessibility of CMS Cor Unum Kimisagara HC for patients				
Less than 1 km	Ref			
1 – 5 Km	1.12	0.89	1.41	0.33
>5 – 10 Km	0.64	0.49	0.84	**0.001**
Over 10 Km	0.58	0.44	0.77	**<0.001**
Satisfaction with Healthcare				

services				
Very satisfied	2.34	1.72	3.18	**<0.001**
Satisfied	1.45	1.12	1.88	**0.004**
Neutral	Ref			

Source: Primary data, 2025

The multivariate analysis presented in Table 4.6 identifies several statistically significant factors associated with adherence to ART among PLHIV aged 18 – 49 years old attending CMS Cor-Unum Kimisagara HC. Age was significantly associated with adherence, where older age may increase good adherence to ART. Participants aged 26–35 had higher odds of good adherence to ART (AOR = 1.4295% CI: 1.10–1.83, p = 0.007) compared to the 18–25 age group, while PLHIV aged 36-49 had 1.65 times odds of good adherence compared to those aged 18-25 (AOR = 1.6595% CI: 1.25–2.18, p<0.001). For gender, there is no significant association with adherence to ART.

Area of residence showed no significant association with adherence. Marital status was another significant predictor of adherence, with married individuals having 1.31 times odds of good adherence to ART compared to singles (AOR = 1.31, 95% CI: 1.02–1.69, p = 0.035). Religion showed non-significant association with adherence, while, education level was strong associated with adherence. Higher education often correlates with better adherence to ART. Participants who were educated to the level of secondary and university increased progressively odds of good adherence compared to those with no formal education (AOR = 1.78, 95% CI: 1.35–2.34, p<0.001) and (AOR=2.21 CI: 1.52-3.21, P<0.001)

Behavioral factors such as smoking/substance use and alcohol consumption were negatively significant associated with adherence. Smoking or use substances reduced odds of good adherence to ARTs by 38% compared to non-smoking (AOR = 0.62, 95% CI: 0.48–0.80,

p<0.001), as did those who consume alcohol had reduced odds of good adherence to ARTs by 29% compare to those who did not consume alcohol (AOR = 0.71, 95% CI: 0.56–0.91, *p*= 0.006). Additionally, those who had disclosed their HIV status had higher odds of good adherence (AOR = 1.89, 95% CI: 1.45–2.47, *p*< 0.001), as well, family support is strong predictor of good adherence as those who received family support for taking ARTs had 2.21 times odds of good adherence to ARTs than those who didn't receive family support (AOR = 2.21, 95% CI: 1.63–2.76, *p*<0.001).

Psychosocial factors were negatively significant associated with adherence to ARTs. Participants who perceived stigma or discrimination had reduced odds of good adherence by 42% compared to those who didn't perceive stigma (AOR = 0.58, 95% CI: 0.45–0.75, P< 0.001), and those with sadness had lower odds of good adherence to ART, 34%than those without sadness (AOR = 0.66, 95% CI: 0.51–0.86, *p*=0.002). Adherence was also negatively associated with side effects from ART with lowering odds of good adherence by 27% compared to participant without side effects to ARTs(AOR = 0.73, 95% CI: 0.57–0.94, *p* = 0.015). The comorbidities and other chronic conditions were not statistically associated withadherence (AOR = 0.81, 95% CI: 0.63–1.05, P= 0.11).

Duration on ART was another significant predictor of adherence. Longer duration on ART improves adherence to ARTs. Compared to those who were on ART for 4–11 months, those who were on treatment for 12–24 months (AOR = 1.28, 95% CI:1.01-1.63,P= 0.04), 25–60 months (AOR = 1.68, 95% CI:1.29-2.19,P<0.001), and over 60 months (AOR = 1.94, 95% CI:1.48-2.54,P<0.001 had progressive higher odds of good adherence to ARTs than those who were on ARTs for period between 4-11months. Availability of ART drugs at the health facility was a

predictor of good adherence to ARTs with 1.41 times odds higher than ARTs stock-out (AOR = 1.41, 95% CI: 1.09–1.83, P = 0.009).

Quality of relationships with healthcare providers and counseling on adherence were significantly associated with good adherence. Those reported excellent relationship (AOR = 2.03, 95% CI:1.52-2.71,P<0.001) or good relationships (AOR = 1.52, 95% CI:1.17-1.98,P= 0.002) with health providers had good adherence to ARTs than those with fair relationships. Additionally, patients who received regularly counseling on ART adherence had 1.67 times odds of good adherence to ARTs than those who did not receive regular counselling on taking ARTs (AOR = 1.67, 95% CI: 1.29–2.17, P<0.001).

Geographical accessibility also influenced adherence. Long travel distance heading to health facility reduces odds of good adherence to ART. Patients came from in 1-5km (AOR = 1.12, 95% CI:0.89-1.41,P= 0.33),5–10 km (AOR = 0.64, 95% CI:0.49-0.84,P= 0.001) and over 10km (AOR = 0.58, 95% CI:0.44-0.77,P<0.001) of the facility had progressive lower odds of good adherence to ART compared to those living within less 1 km away. Finally, satisfaction with healthcare services showed some positive association with adherence. Individuals who were very satisfied had significant higher odds of good adherence to ART (AOR = 2.34, 95% CI: 1.72-3.18*p*<0.001)compared to those who were neutral.

4.7 Discussion of findings

4.7.1 Level of adherence to ART among people living with HIV aged between 18 and 49 years old at CMS Cor Unum Kimisagara HC.

The present study revealed that 72.9% of participants adhered to their ART regimen, while 27.1% were non-adherent. This level of adherence is relatively consistent with findings from

sub-Saharan Africa, where adherence rates range between 43% and 84%, depending on the region (Almeida et al., 2024). Specifically, this study's adherence rate aligns with adherence observed in South Africa (63–88%)(Kaswa & De Villiers, 2023), suggesting that Rwanda is performing moderately well in the regional context. Compared to the global average adherence rate of 62% reported by (Woolf-King et al., 2022) , the present study demonstrates a higher level of adherence than worldwide average adherence rate. However, it falls short when compared to developed countries, such as the United States, where adherence can reach up to 80% or more (Mate et al., 2023).

4.7.2 Psychosocial factors associated with adherence to ART.

The study demonstrated that married individuals had an AOR of 1.31 to ART adherence than their single counterparts (95% CI: 1.02–1.69, p = 0.035). This finding is supported by Mshangila et al. (2024), who showed that individuals receiving family support had a higher adherence prevalence (PR = 1.431; 95% CI: 1.245–1.644), although the effect diminished in multivariate analysis(Mshangila et al., 2024). The social support associated with marriage may enhance medication reminders, emotional encouragement, and reduced stigma.

Smoking/substance use and alcohol consumption in this study markedly reduced good adherence rates: Smokers (AOR = 0.62, 95% CI: 0.48–0.80, p = 0.006) and alcohol consumers (AOR = 0.71, 95% CI: 0.56–0.91, p <0.001). This aligns closely with findings from Tanzania, where alcohol intake was significantly associated with non-adherence (APR = 0.820, 95% CI: 0.728–0.923) (Mshangila et al., 2024). The significant negative influence of substance use is well-documented across various settings, highlighting the importance of integrating substance abuse counseling into ART programs.

4.7.3 Clinical and ART medication-related factors associated with adherence to ART.

This study revealed that Side effects from ART had negative impact on adherence to ART (AOR = 0.73, 95% CI: 0.57–0.94, p = 0.015). These findings are consistent with Almeida et al. (2024), who observed that ART-related side effects were a common barrier to adherence across multiple SSA countries(Almeida et al., 2024). Similarly, Dorcélus et al. (2021) found that individuals with difficulties meeting basic health needs or managing other illnesses had poor adherence (OR: 2.70, 95% CI: 1.04–7.00) (Dorcélus et al., 2021).

Adherence to ART significantly increased with longer treatment duration, with individuals on ART for 25–60 months having 1.68 times the odds of good adherence to ART (AOR = 1.68, p <0.001), and those on ART for over 60 months having higher odds of good adherence (AOR=1.94, p<0,001, but other studies in SSA report that patients on long-term ART tend to develop better routines and coping mechanisms, thereby improving adherence (AOR = 1.143, p = 0.142) (Dorcélus et al., 2021).

4.7.4 Health services-related factors associated with adherence to ART.

Geographical accessibility also influenced adherence. Long travel distance heading to health facility reduces odds of good adherence to ART. Patients came from in 1-5km (AOR = 1.12, 95% CI:0.89-1.41,P= 0.33),5–10 km (AOR = 0.64, 95% CI:0.49-0.84,P= 0.001) and over 10km (AOR = 0.58, 95% CI:0.44-0.77,P<0.001) of the facility had progressive lower odds of good adherence to ART compared to those living within less 1 km away. This finding is consistent with other findings of Magura et al. (2025) conducted a scoping review across sub-Saharan Africa and found that patients living >10 km from health facilities had significantly lower adherence to ART (AOR = 0.59, 95% CI: 0.45–0.77, P<0,001) closely matching with the odds

ratio of my findings(Magura et al., 2025). The study conducted also by Buh et al. (2022) highlighted that in rural Nigeria, patients traveling >10 km had 40% lower odds of adherence (AOR = 0.60, 95% CI: 0.46–0.78, P<0.001)(Buh et al., 2023). These studies confirm that longer travel distances are a significant barrier to ART adherence, with progressively lower odds observed beyond 5 km.

Finally, satisfaction with a quality of healthcare services showed some positive association with adherence. Individuals who were very satisfied had significant higher odds of good adherence to ART (AOR = 2.34, 95% CI: 1.72-3.18p<0.001)compared to those who were neutral. This finding align with findings of study conducted in Egypt in 2024 by Magdy et al., (2024) stating that fair satisfaction with the health services at ART clinics (OR [95% CI]: 1.86 [1.27–2.73]) appeared as independent predictors of poor adherence(Magdy et al., 2024)The study had several key limitations. Its cross-sectional design restricts causal interpretations between studied factors and ART adherence. Reliance on self-reported data may introduce recall and social desirability biases. Conducted at a single health facility, findings may not be generalizable to broader populations in Rwanda or Sub-Saharan Africa. Additionally, the study did not explore psychological factors like mental health, which could influence adherence.

Despite these limitations, the study offers valuable implications for healthcare policy and practice. It underscores the need for targeted interventions to improve ART adherence, especially among individuals facing substance use , alcohol consumption or treatment side effects. It highlights the role of social support, marital status, and healthcare access in improving adherence. Importantly, the findings advocate for integrating stigma reduction initiatives and educational efforts into routine HIV care. Lastly, the study encourages further research on psychological contributors to ART adherence to inform more holistic interventions.

Conclusion

In conclusion, this study revealed a relatively high level of ART adherence among people living with HIV, with significant associations observed between adherence and factors such as gender, residence, marital status, substance use, presence of chronic conditions, ART side effects, and duration on treatment. Females, urban residents, married individuals, and those who abstained

from alcohol and smoking had higher odds of adhering to their ART regimen. These findings underscore the need for tailored interventions that address individual and contextual factors to further improve adherence and health outcomes among PLHIV in Rwanda.

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