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Original Article

Factors Associated with Non-Adherence to Antiretroviral Therapy Among HIV Patients at Kibungo Referral Hospital, Rwanda.

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Abstract

Background: It has been demonstrated that antiretroviral therapy improves health and lengthens the life of HIV positive individuals. For those living with HIV, attaining optimal adherence is turning out to be the largest obstacle. The purpose of this research was to determine how often antiretroviral therapy non-adherence is among HIV patients who visit Rwanda's Kibungo Referral Hospital.

Methods: This study utilized a quantitative, cross-sectional design. Data collection was conducted from March 25th to April 30, 2024, with a sample size of 396 HIV patients on ART at Kibungo Referral Hospital. Inclusion criteria included patients aged 18 years and older who had been on ART for six months, while exclusion criteria included lack of consent and hospitalized patients. A structured questionnaire was used. The Fisher exact test and logistic regression were employed to analyze associations, with significance set at $p < 0.05$ and 95% CI.

Findings: The findings showed that the overall non-adherence rate to ART was 13% while the adherence rate was 87%. Also, patients without tertiary education are significantly more likely to be non-adherent to ART compared to those with tertiary education (AoR: 8.232, 95% CI: 4.124-17.217, P-value: <0.001). Patients who experience stigma are more likely to be non-adherent to ART (AoR: 2.148, 95% CI: 1.032-6.689, P-value: 0.015). Patients who perceive ART as ineffective are significantly more likely to be non-adherent (AoR: 9.333, 95% CI: 2.108-20.638, P-value: <0.001. Patients who do not integrate ART into their daily routines are significantly more likely to be non-adherent (AoR: 11.180, 95% CI: 5.879-28.338, P-value: <0.001). There is no significant association between not setting an alarm and non-adherence.

Conclusion: The study found a high non-adherence rate to ART among HIV patients at Kibungo Referral Hospital, linked to factors such as younger age, lack of tertiary education, stigma, and perceived ineffectiveness of ART. It recommends implementing structured support systems and targeted interventions to improve adherence and health outcomes for these patients.

Key words: Prevalence, Factor, Non-Adherence, Antiretroviral Therapy

Introduction

Human Immunodeficiency Virus (HIV) continues to pose a major global health challenge despite significant advances in treatment and prevention strategies. According to the World Health Organization (WHO, 2023), an estimated 39 million people were living with HIV globally in 2022, with more than 40 million cumulative deaths since the start of the epidemic. A key strategy in controlling HIV is Antiretroviral Therapy (ART), which involves combinations of medications to suppress viral replication, strengthen immune function, and extend life expectancy. Maintaining high levels of adherence patients taking ART exactly as prescribed is essential for achieving viral suppression, preventing drug resistance, and reducing transmission (UNAIDS, 2023). Adherence to ART remains suboptimal in many parts of the world, particularly in Sub-Saharan Africa (SSA), which bears the highest burden of HIV infection. Challenges in SSA include social stigma, poverty, limited healthcare infrastructure, cultural and religious beliefs, and mental health issues (Nachega et al., 2012; WHO, 2022). Additional factors such as alcohol use, reliance on traditional medicine, dissatisfaction with healthcare services, and insufficient social support further complicate consistent ART use (Smith et al., 2020). These barriers underscore the complexity of achieving sustained adherence in resource-limited settings. Rwanda has made notable progress in its HIV response by ensuring universal free access to ART, prioritizing early treatment initiation, and integrating HIV services into the primary healthcare system. The country has approached the UNAIDS 95-95-95 targets, with 94% of people living with HIV aware of their status, 94.6% on treatment, and 91% achieving viral suppression by 2022 (Ministry of Health Rwanda, 2023). Despite this success, adherence challenges persist in certain regions and populations. Studies have reported non-adherence rates of 10.2% at Ruhengeri Referral Hospital and 16% in Nyaruguru District (Uwimana et al., 2021; Habimana et al., 2022), indicating local variations in treatment outcomes.

In Eastern Rwanda, Kibungo Referral Hospital serves a large and diverse population but lacks detailed data on the barriers to ART adherence among its HIV patients. Despite the availability and accessibility of free ART services, adherence is not universal, and specific obstacles in this setting remain underexplored. Understanding these factors is essential for developing effective, locally tailored interventions to improve treatment outcomes.

The purpose of this study is to identify and describe the factors associated with non-adherence to antiretroviral therapy among HIV patients attending Kibungo Referral Hospital in Rwanda.

Methods and Materials

Research Design

A cross-sectional study design using a quantitative approach was employed to assess antiretroviral therapy (ART) non-adherence among HIV-positive patients at Kibungo Referral Hospital.

Study Population

The study targeted HIV-positive adults aged 18 years and older who had been on ART for at least six months and received services within Kibungo Referral Hospital's catchment area. The total population was 3,508 individuals (1,315 males and 2,193 females). This focus ensured inclusion of patients with sufficient treatment experience to assess adherence behaviors. Participants were included if they were HIV-positive adults (≥18 years) on ART for six months or longer and provided informed consent. Individuals who were critically ill or hospitalized at the time of data collection were excluded to avoid ethical concerns and because their health status could impede their ability to participate meaningfully or reliably in the interview process. Those unwilling to participate were also excluded.

Sample Size and Sampling Technique

The sample size was calculated using Yamane's formula (Yamane, 1967) with a 5% margin of error and the total population (N = 3,508): n=N1+N(e)2=3,5081+3,508(0.05)2≈400n = {N}{1 + N(e)^2} = {3,508}{1 + 3,508(0.05)^2} \400n=1+N(e)2N=1+3,508(0.05)23,508≈400 To account for an anticipated 10% non-response rate, the final target sample was increased to 440 participants. The achieved response rate yielded 424 completed interviews. A stratified random sampling technique was used to ensure representation across all 14 service areas, including 13 health centers and the referral hospital. Within each stratum, simple random sampling was applied to select participants proportionally to the size of the HIV-positive patient population served at each facility.

Research Instruments

Data were collected using a structured questionnaire developed through adaptation and contextual modification of validated items from previous studies. Data collection was conducted from March 25 to April 30, 2024. The questionnaire was divided into three sections: Section 1: Sociodemographic and behavioral characteristics (e.g., age, gender, marital status, education level, employment, religion, distance to ART services, waiting time).Section 2: Disease- and treatment-related factors (e.g., time since HIV diagnosis, number of pills per day, duration on ART, side effects).Section 3: Individual factors (e.g., number of sexual partners, tobacco and alcohol use, disclosure of HIV status to friends or family).

Reliability and Validity

A pilot test involving 10% of the calculated sample was conducted at Kabarondo Health Center in Kayonza District to evaluate the questionnaire's reliability. Internal consistency was assessed using Cronbach's alpha, which yielded a value of 0.71, indicating acceptable reliability. Feedback from the pilot study informed minor revisions to improve clarity and relevance of the questions. Content and face validity were established through expert review by academic supervisors. A Content Validity Index (CVI) of 0.81 was calculated, confirming adequate coverage and appropriateness of the items included in the questionnaire.

Data Analysis

Data were entered into Microsoft Excel and exported to SPSS version 21 for analysis. Descriptive statistics were calculated to summarize categorical variables as frequencies and percentages. The primary adherence outcome was measured using a single direct question on ART adherence in the past month (coded as Yes = 1, No = 0). The use of a single-item measure is acknowledged as a limitation due to its reduced sensitivity but was selected for feasibility and consistency with prior studies in similar settings (Wilson et al., 2020). Associations between ART non-adherence and independent variables were analyzed using Fisher's exact test and logistic regression, with p-values < 0.05 considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Mount Kenya University Ethical Review Board (Reference number: MKU/ETHICS/23/01/2024(1)). Authorization was also granted by Kibungo Referral Hospital to conduct the study. All participants were fully informed about the study's purpose, procedures, risks, and benefits. Informed consent was obtained in writing before participation. Participants' confidentiality was protected using study ID codes; no identifying information was collected or shared. Interviews were conducted privately, with participants free to withdraw at any time without consequence. Data were stored securely and analyzed only in aggregate form to ensure anonymity.

Results

Prevalence of non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo referral hospital, Rwanda

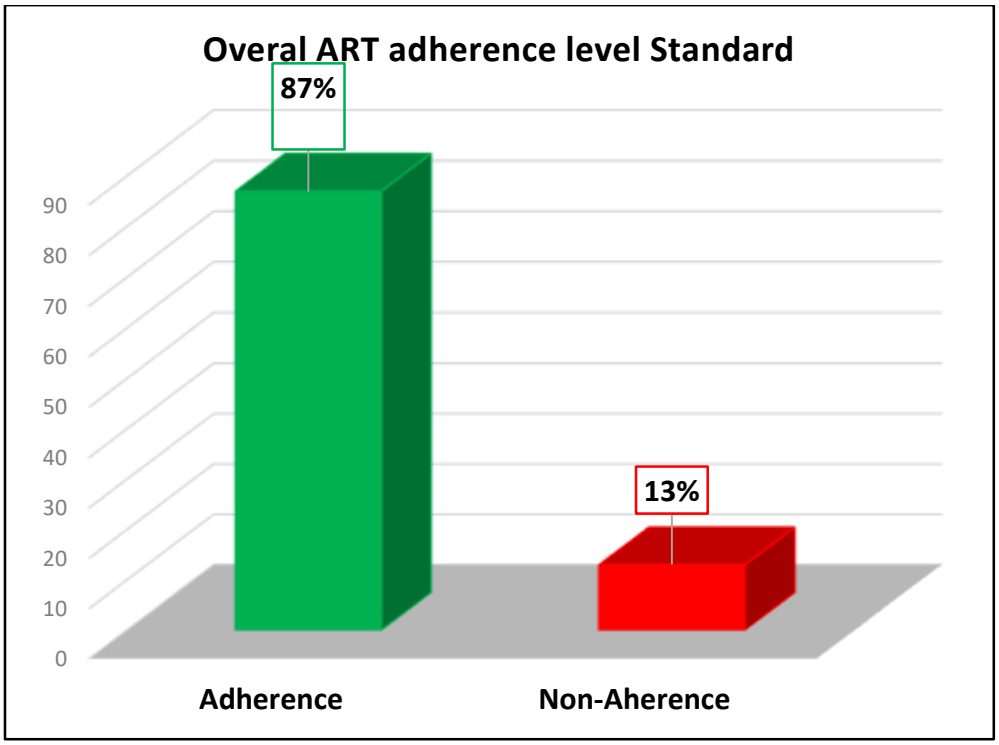

Figure 1: Prevalence of non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo referral hospital, Rwanda

The first objective of this study was to determine the prevalence of non-adherence to antiretroviral therapy among HIV patients within the catchment area of Kibungo Referral Hospital, Rwanda. The findings revealed that the overall non-adherence rate to ART was 13% (55 patients), while the adherence rate was 87% (369 patients).

Table 1. Bivariate analysis of socio-demographic factors associated with non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo referral hospital.

Variables	**Factors associated to ART Non-Adherence**			**Fisher test**	**P-value**
	No n(%)	**Yes n(%)**	**Total(%)**		
Age					**<0.001**
1-30 Years Old	30(1.7)	8(1.9)	38(8.9)		
31-40 Years Old	66(15.6)	16(3.8)	82(19.3)		
41-50 Years Old	117(27.6)	16(3.8)	133(31.4)		
51-80 Years Old	156(36.8)	15(3.5)	171(40.2)		

Total	369(87.0)	55(13.0)	424(100.0)	
Gender				0.524
Male	191(45.0)	31(7.3)	222(52.4)	
Female	178(42.0)	24(5.7)	202(47.6)	
Total	369(87.0)	55(13.0)	424(100.0)	
Marital status				0.087
Single	47(11.1)	8(1.9)	55(13.0)	
Married	217(51.2)	24(5.7)	241(56.8)	
Divorced	105(24.8)	235.4 ()	128(30.2)	
Total	369(87.0%)	55(13.0)	424(100.0)	
Education				**0.014**
Primary education	150(35.4)	24(5.7)	174(41.0)	
>=Secondary Education	219(51.7)	31(7.3)	250(59.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
Employment status				0.083
Employed	276(65.1)	47(11.1)	323(76.2)	
Unemployed	93(21.9)	8(1.9)	101(23.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
Number of people in one's home				**<0.001**
1-2	41(9.7)	8(1.9)	49(11.6)	
Three	125(29.5)	8(1.9)	133(31.4)	
>=Four	203(47.9)	39(9.2)	242(58.1)	
Total	369(87.0)	55(13.0)	424(100.0)	

Source: Primary data, 2024

Table 1 presents the bivariate analysis results of socio-demographic factors and their association with non-adherence to antiretroviral therapy (ART). Indeed, non-adherence to ART is significantly associated with age. The highest non-adherence rates are observed in the age groups 41-50 years (27.6%) and 51-60 years (33.3%). Younger and older age groups show lower non-adherence rates, with those aged 21-30 years having no cases of non-adherence (Fisher exact test P-value < 0.001). Also, there is a significant association between educational level and ART adherence. Non-adherence is higher among those with primary education (35.4%) and secondary

education (40.1%), while no cases of non-adherence are reported among those with tertiary education (P-value = 0.014). The number of people in one's home is significantly associated with ART adherence. Non-adherence is highest among those living in households with three (29.5%) or more than five (24.3%) people. Households with two people show no cases of non-adherence (P-value < 0.001). In sum, these findings indicate that age, education, and household size are significant socio-demographic factors affecting ART adherence among HIV patients in the Kibungo referral hospital catchment area. **(Table.1)**

Table 2. Bivariate analysis of HAART taking, and behavioral factors associated with non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo. referral hospital.

Variable	Factors associated to ART Non-Adherence.			Fisher test	P-value
	No n (%)	Yes n (%)	Total (%)		
Having more than one sexual partner					**0.046**
Yes	100(23.6)	8(1.9)	108(25.5)		
No	269(63.4)	47(11.1)	316(74.5)		
Total	369(87.0)	55(13.0)	424(100.0)		
Time it typically takes one to travel to the ART service center (Minutes)					**<0.001**
<15min	72(17.0)	0(0.0)	72(17.0)		
16 to 45 min	95(22.4)	32(7.5)	127(30.0)		
46 to 60 min	202(47.6)	23(5.4)	225(53.1)		
Total	369(87.0)	55(13.0)	424(100.0)		
How long one waits for care when reached the ART service					**0.045**
15 to 30 min	220(51.9)	39(9.2)	259(61.1)		
31 to >1hour	149(35.2)	16(3.8)	165(38.9)		
Total	369(87.0)	55(13.0)	424(100.0)		

Smoking				**0.002**
Yes	49(11.6)	16(3.8)	65(15.3)	
No	320(75.5)	39(9.2)	359(84.7)	
Total	369(87.0)	55(13.0)	424(100.0)	
Alcohol intake				0.903
Yes	56(13.2)	8(1.9)	64(15.1)	
No	313(73.8)	47(11.1)	360(84.9)	
Total	369(87.0)	55(13.0)	424(100.0)	
How long one has been under ART				0.546
1-2 years	86(20.3)	15(3.5)	101(23.8)	
3-5 years	242(57.1)	32(7.5)	274(64.6)	
>5 years	41(9.7)	8(1.9)	49(11.6)	
Total	369(87.0)	55(13.0)	424(100.0)	
Having ever had ART-related side effect				0.543
Yes	66(15.6)	8(1.9)	74(17.5)	
No	303(71.5)	47(11.1)	350(82.5)	
Total	369(87.0)	55(13.0)	424(100.0)	
Having disclosed one's status to one's family				0.431
Yes	314(74.1)	49(11.6)	363(85.6)	
No	55(13.0)	6(1.4)	61(14.4)	
Total	369(87.0)	55(13.0)	424(100.0)	
Having disclosed one's status to their friends				**<0.001**
Yes	0(0.0)	55(13.0)	55(13.0)	
No	369(87.0)	0(0.0)	369(87.0)	
Total	369(87.0)	55(13.0)	424(100.0)	

Source: Primary data, 2024

Table 2 presents the bivariate analysis of HAART (Highly Active Antiretroviral Therapy) taking and behavioral factors associated with non-adherence to antiretroviral therapy (ART). Indeed, there is a significant association between having more than one sexual partner and non-adherence to ART.23.6% of non-adherent patients have more than one sexual partner compared to 1.9% of adherent patients (Fisher exact test P-value = 0.046). Travel time to the ART service center is significantly associated with ART adherence. No patients who take less than 15 minutes to travel to the ART service center are non-adherent, while those taking 16 to 29 minutes (7.5%) and 46 to 60 minutes (5.4%) show higher non-adherence rates (Fisher exact test P-value < 0.001). The waiting time for care at the ART service center is significantly associated with ART adherence. Patients who wait 15 to 30 minutes have a non-adherence rate of 9.2%, while those who wait longer than 30 minutes show lower non-adherence rates (Fisher exact test P-value = 0.045). Smoking is significantly associated with non-adherence to ART.11.6% of non-adherent patient's smoke compared to 3.8% of adherent patients (Fisher exact test P-value = 0.002). Disclosing one's HIV status to friends is significantly associated with non-adherence to ART. None of the non-adherent patients have disclosed their status to their friends, whereas 13% of adherent patients have (P-value < 0.001). In sum, these findings indicate that having multiple sexual partners, longer travel and waiting times, smoking, and non-disclosure of HIV status to friends are significant behavioral factors affecting ART adherence among HIV patients in the Kibungo referral hospital catchment area. (Table. 2)

Table 3. Bivariate analysis of individual Psycho-behavioral factors associated with non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo. referral hospital.

Variable	**Factors associated to ART Non-Adherence**			**Fisher test**	**P-value**
	No n(%)	**Yes n(%)**	**Total (%)**		
Refusing to attend ART appointments poses a serious risk one's health					**<0.001**
Yes	15(3.5)	31(7.3)	46(10.8)		
No	354(83.5)	24(5.7)	378(89.2)		
Total	369(87.0)	55(13.0)	424(100.0)		
The progression of HIV to AIDS can be sped up by not taking ART medicine as prescribed					**<0.001**
Yes	337(79.5)	16(3.8)	353(83.3)		
No	32(7.5)	39(9.2)	71(16.7)		
Total	369(87.0)	55(13.0)	424(100.0)		

The consequences of not adhering to ART medication are severe				0.696
Yes	117(27.6)	16(3.8)	133(31.4)	
No	252(59.4)	39(9.2)	291(68.6)	
Total	369(87.0)	55(13.0)	424(100.0)	
Irregular intake of ART medication can increase the risk of death				**0.007**
Yes	91(21.5)	23(5.4)	114(26.9)	
No	278(65.6)	32(7.5)	310(73.1)	
Total	369(87.0)	55(13.0)	424(100.0)	
Non-adherence to ART medication to be a life-threatening behavior				0.940
Yes	163(38.4)	24(5.7)	187(44.1)	
No	206(48.6)	31(7.3)	237(55.9)	
Total	369(87.0)	55(13.0)	424(100.0)	
By adhering to my therapy regimen, I can regain my health				**0.007**
Yes	172(40.6)	15(3.5)	187(44.1)	
No	197(46.5)	40(9.4)	237(55.9)	
Total	369(87.0)	55(13.0)	424(100.0)	
I can lower my viral load by sticking to my medication regimen				0.497
Yes	327(77.1)	47(11.1)	374(88.2)	
No	42(9.9)	8(1.9)	50(11.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
Adhering to my treatment plan improves my condition				**0.007**
Yes	315(74.3)	39(9.2)	354(83.5)	
No	54(12.7)	16(3.8)	70(16.5)	
Total	369(87.0)	55(13.0)	424(100.0)	
For my health to improve, I must strictly follow my treatment regimen				**<0.001**
Yes	325(76.7)	32(7.5)	357(84.2)	
No	44(10.4)	23(5.4)	67(15.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
The time it takes for me to reach ART services is a barrier to my adherence				0.867
Yes	361(85.1)	54(12.7)	415(97.9)	
No	8(1.9)	1(0.2)	9(2.1)	

Total	369(87.0)	55(13.0)	424(100.0)	
My inability to take my ART medicine as prescribed is caused by the amount of alcohol I drink				0.105
Yes	330(77.8)	53(12.5)	383(90.8)	
No	39(9.2)	2(0.5)	41(9.7)	
Total	369(87.0)	55(13.0)	424(100.0)	
My smoking habit interferes with my ability to adhere to my ART medication				**0.035**
Yes	24(5.7)	8(1.9)	32(7.5)	
No	345(81.4)	47(11.1)	392(92.5)	
Total	369(87.0)	55(13.0)	424(100.0)	
It's challenging for me to follow the treatment regimen because of the side effects of my ART drug				**<0.001**
Yes	22(5.2)	16(3.8)	38(9.0)	
No	347(81.8)	39(9.2)	386(91.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
Stigma associated with HIV makes it difficult for me to adhere to my ART medication				**0.03**
Yes	153(36.2)	31(7.3)	184(43.5)	
No	215(50.8)	24(5.7)	239(56.5)	
Total	369(87.0)	55(13.0)	424(100.0)	
My inability to disclose my HIV status makes it challenging for me to take my ART as prescribed	87.0%	13.0%	100.0%	**<0.001**
Yes	15(3.5)	8(1.9)	23(5.4)	
No	354(83.5)	47(11.1)	401(94.6)	
Total	369(87.0)	55(13.0)	424(100.0)	
Forgetfulness is a barrier to my adherence to my ART medication				**0.02**
Yes	53(12.5)	2(0.5)	55(13.0)	
No	316(74.5)	53(12.5)	369(87.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
ART is still effective even if not used regularly				**0.005**
Yes	88(20.8)	23(5.4)	111(26.2)	
No	281(66.3)	32(7.5)	313(73.8)	
Total	369(87.0)	55(13.0)	424(100.0)	

Even if adverse effects start to interfere with my everyday activities, I would continue with the course of treatment				0.083
Yes	93(21.9)	8(1.9)	101(23.8)	
No	276(65.1)	47(11.1)	323(76.2)	
Total	369(87.0)	55(13.0)	424(100.0)	
I incorporate my therapy into my everyday activities				**<0.001**
Yes	45(10.6)	53(12.5)	98(23.1)	
No	324(76.4)	2(0.5)	326(76.9)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even if it involves taking medicine or engaging in other activities in front of individuals who are unaware that I am HIV-positive, I would include my medication in my everyday activities				**<0.001**
Yes	15(3.5)	53(12.5)	68(16.0)	
No	354(83.5)	2(0.5)	356(84.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even if something interferes with my routine, I would still follow my therapy regimen				**<0.001**
Yes	46(10.8)	31(7.3)	77(18.2)	
No	323(76.2)	24(5.7)	347(81.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
When I'm getting under the weather, I would adhere to my medication schedule				**<0.001**
Yes	337(79.5)	16(3.8)	353(83.3)	
No	32(7.5)	39(9.2)	71(16.7)	
Total	369(87.0)	55(13.0)	424(100.0)	
I would adhere to my medication regimen even if it meant altering my dietary routine				0.696
Yes	117(27.6)	16(3.8)	133(31.4)	
No	252(59.4)	39(9.2)	291(68.6)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even if continuing the medication causes disruptions to my everyday routine, I would still adhere to it				**0.04**
Yes	105(24.8)	23(5.4)	128(30.2)	

No	264(62.3)	32(7.5)	296(69.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even if my T-cell count fell dramatically over the following three months, I would still adhere to the medication schedule that my doctor had recommended				0.465
Yes	142(33.5)	24(5.7)	166(39.2)	
No	227(53.5)	31(7.3)	258(60.8)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even at moments when I become disheartened about my health, I would persist with my medicine				**0.007**
Yes	172(40.6)	15(40.6)	187(44.1)	
No	197(46.5)	40(46.5)	237(55.9)	
Total	369(87.0)	55(13.0)	424(100.0)	

Source: Primary data, 2024

Table 3 presents the bivariate analysis of individual psycho-behavioral factors associated with non-adherence to antiretroviral therapy (ART) among HIV patients in the catchment of Kibungo referral hospital. Indeed, refusing to attend ART appointments poses a serious risk to one's health. There is a significant association between refusing to attend ART appointments and non-adherence to ART. Those who perceive a serious risk in missing appointments are more likely to adhere to ART (P-value:<0.001). The progression of HIV to AIDS can be sped up by not taking ART medicine as prescribed. There is a significant association between the belief that not taking ART medicine as prescribed can speed up HIV progression to AIDS and non-adherence to ART. Patients who believe in the severity of not adhering to ART are more likely to adhere to their medication (P-value:<0.001). Irregular intake of ART medication can increase the risk of death. There is a significant association between the belief that irregular intake of ART can increase the risk of death and non-adherence to ART. Patients who recognize the risk of death due to irregular intake are more likely to adhere to their medication (P-value: 0.007). Smoking poses a serious risk to one's health. There is a significant association between smoking and non-adherence to ART. Smokers are more likely to be non-adherent to their ART regimen compared to non-smokers (P-value: 0.002). However, there is no significant association between the belief in severe consequences of not adhering to ART, alcohol consumption and the duration of ART usage and non-adherence.

Table 4. Bivariate analysis of challenges related factors associated with non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo referral hospital.

Variables	Factors associated to ART Non-Adherence			Fisher test	P-value
	Non (%)	Yes n (%)	Total (%)		
Even though it is somewhat difficult for me to get to my clinic sessions, I would nevertheless keep going with my medication					0.497
Yes	327(77.1)	47(11.1)	374(88.2)		
No	42(9.9)	8(1.9)	50(11.8)		
Total	369(87.0)	55(13.0)	424(100.0)		
Even if close friends and family members told me they didn't think the medication was working, I would still go ahead and continue					**0.024**
Yes	308(72.6)	39(9.2)	347(81.8)		
No	61(14.4)	16(3.8)	77(3.8)		
Total	369(87.0)	55(13.0)	424(100.0)		
Even though the medicine I'm taking doesn't make me healthier, I still benefit from going to treatments					**<0.001**
Yes	325(76.7)	32(7.5)	357(84.2)		
No	44(10.4)	23(5.4)	67(15.8)		
Total	369(87.0)	55(13.0)	424(100.0)		
Reminders from health workers for a refill help me adhere to my ART medication					0.503
Yes	361(85.1)	53(12.5)	414(97.6)		
No	8(1.9)	2(0.5)	10(2.4)		
Total	369(87.0)	55(13.0)	424(100.0)		
Having a friend or family member remind me to take my medication helps me adhere to my ART medication					0.105
Yes	330(77.8)	53(12.5)	383(90.3)		
No	39(9.2)	2(0.5)	41(9.7)		
Total	369(87.0)	55(13.0)	424(100.0)		
Setting an alarm on my phone as a reminder to take my					**0.035**

medication helps me adhere to my ART medication				
Yes	24(5.7)	8(1.9)	32(7.5)	
No	345(81.4)	47(11.1)	392(92.5)	
Total	369(87.0)	55(13.0)	424(100.0)	
The time it takes for me to reach ART services is a barrier to my adherence				0.867
Yes	361(85.1)	54(12.7)	415(97.9)	
No	8(1.9)	1(0.2)	9(2.1)	
Total	369(87.0)	55(13.0)	424(100.0)	
My inability to take my ART medicine as prescribed is caused by the amount of alcohol I drink				0.105
Yes	330(77.8)	53(12.5)	383(90.3)	
No	39(9.2)	2(0.5)	41(9.7)	
Total	369(87.0)	55(13.0)	424(100.0)	
Forgetfulness is a barrier to my adherence to my ART medication				**0.027**
Yes	53(12.5)	2(0.5)	55(13.0)	
No	316(74.5)	53(12.5)	369(87.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
I incorporate my therapy into my everyday activities				**<0.001**
Yes	45(10.6)	53(12.5)	98(23.1)	
No	324(76.4)	2(0.5)	326(76.9)	
Total	369(87.0)	55(13.0)	424(100.0)	
Even if it involves taking medicine or engaging in other activities in front of individuals who are unaware that I am HIV-positive, I would include my medication in my everyday activities				**0.001**
Yes	15(3.5)	53(12.5)	68(16.0)	
No	354(83.5)	2(0.5)	356(84.0)	
Total	369(87.0)	55(13.0)	424(100.0)	
Reminders from health workers for a refill help me adhere to my ART medication				0.503
Yes	361(85.1)	53(12.5)	414(97.6)	
No	8(1.9)	2(0.5)	10(2.4)	
Total	369(87.0)	55(13.0)	424(100.0)	

Having a friend or family member remind me to take my medication helps me adhere to my ART medication				0.105
Yes	330(77.8)	53(12.5)	383(90.3)	
No	39(9.2)	2(0.5)	41(9.7)	
Total	369(87.0)	55(13.0)	424(100.0)	

Source: Primary data, 2024

Table 4 presents the bivariate analysis of challenges related factors associated with non-adherence to antiretroviral therapy (ART) among HIV patients in the catchment of Kibungo Referral Hospital. Patients who would continue their medication despite negative feedback from close friends and family members show better adherence (72.6% of adherent patients agree with this statement compared to 14.4% who do not) (P-value: 0.024). Patients who perceive benefit from treatments despite not feeling healthier are more likely to adhere (76.7% of adherent patients agree with this statement compared to 10.4% who do not) (P-value: <0.001). Patients who maintain their medication schedule even when feeling unwell are more adherent (79.5% of adherent patients agree with this statement compared to 7.5% who do not) (P-value: <0.001). Patients willing to continue medication despite disruptions to their routine are more adherent (24.8% of adherent patients agree with this statement compared to 62.3% who do not (P-value: 0.040).Patients who persist with their medication despite feeling disheartened about their health are more adherent (40.6% of adherent patients agree with this statement compared to 46.5% who do not) (P-value: 0.007).These significant associations highlight that psychological resilience and the perceived benefit of treatment play crucial roles in ART adherence among HIV patients.

Table 5. Multivariate analysis of factors associated with non-adherence to antiretroviral therapy among HIV patients in the catchment of Kibungo referral hospital.

Variables	**Factors associated with non-adherence to antiretroviral drugs among HIV patients at Kibungo referral Hospital**		**P-value**
	AOR	**95%CI**	
Age>=31 years old			
Yes	Ref		
No	15.462	3.462-19.748	**0.02**
Tertiary Education			
Yes	Ref		
No	8.232	4.124-17.217	**<0.001**
Stigma interfere with adherence			

No	Ref		
Yes	2.148	1.032-6.689	**0.015**
Effective ART			
Yes	Ref		
No	9.333	2.108-20.638	**<0.001**
ART integration in Everyday activity			
Yes	Ref		
No	11.180	5.879-28.338	**<0.001**
Setting alarm as reminder			
Yes	Ref		
No	1.139	0.112-4.412	0.9

Source: Primary data, 2024

Multivariate analysis of the factors associated with non-adherence to antiretroviral therapy (ART) among HIV patients at Kibungo Referral Hospital showed that patients younger than 31 years old are significantly more likely to be non-adherent to ART compared to those with 31 years and older (AoR 15.462, CI 3.462-19.748, P-value: 0.02). Patients without tertiary education are significantly more likely to be non-adherent to ART compared to those with tertiary education (AoR: 8.232, 95% CI: 4.124-17.217, P-value: =0.001). Patients who experience stigma are more likely to be non-adherent to ART (AoR: 2.148, 95% CI: 1.032-6.689, P-value: 0.015). Patients who perceive ART as ineffective are significantly more likely to be non-adherent (AoR: 9.333, 95% CI: 2.108-20.638, P-value: =0.001. Patients who do not integrate ART into their daily routines are significantly more likely to be non-adherent (AoR: 11.180, 95% CI: 5.879-28.338, P-value: =0.001). There is no significant association between not setting an alarm and non-adherence. In sum, the findings indicate that younger age, lack of tertiary education, stigma, perceived ineffectiveness of ART, and failure to integrate ART into daily activities are significant factors associated with non-adherence to ART among HIV patients at Kibungo Referral Hospital. Setting an alarm as a reminder does not significantly impact adherence. (Table. 5)

Discussion

This study assessed the prevalence and factors associated with non-adherence to antiretroviral therapy (ART) among HIV-positive patients at Kibungo Referral Hospital in Rwanda. The observed non-adherence rate of 13% is relatively favorable compared to many regional and international contexts but nonetheless represents an important public health challenge requiring targeted intervention. Variation in adherence rates across settings often reflects deeper social, cultural, and health system factors. For instance, Ethiopia and Nigeria have reported higher non-adherence rates exceeding 20–30%, which may be partly explained by differences in healthcare accessibility, patient education programs, and levels of stigma within communities (Abebe et al., 2020; Okeke et al., 2019). In contrast, Kibungo's comparatively lower rate may reflect Rwanda's strong national commitment to

HIV services, characterized by decentralized care, universal free ART access, and integration of HIV services into primary healthcare (Ministry of Health Rwanda, 2023). However, local variations even within Rwanda such as slightly lower non-adherence rates observed at Ruhengeri Referral Hospital highlight that social determinants like poverty, health literacy, and community support systems remain highly variable and important to address.

Rather than simply comparing rates, it is essential to understand underlying drivers. Cultural factors, such as community norms around disclosure and stigma, may strongly shape adherence behaviors. Health system factors including availability of counseling services, wait times, and staff attitudes also influence patient trust and engagement. In Kibungo, the relatively strong adherence outcomes may indicate effective facility-level practices such as patient education and consistent medication supply chains. However, the persistent 13% non-adherence underscores that these systems do not yet fully reach all patients equally, particularly vulnerable subgroups.

This study identified several key factors associated with non-adherence. Younger patients (below 31 years) were nearly 15 times more likely to be non-adherent, emphasizing an urgent need for youth-focused interventions. This may reflect the unique life-stage challenges faced by younger adults, including mobility for work or study, competing social priorities, and less experience managing chronic illness (Mutumba et al., 2016). Education level also emerged as a critical determinant; those without tertiary education were significantly more likely to be non-adherent, underscoring the role of health literacy in understanding treatment importance and managing side effects. Stigma remained a significant barrier in this setting. Patients perceiving high levels of stigma were over twice as likely to be non-adherent, consistent with evidence that fear of disclosure and discrimination can lead to missed doses or clinic visits (Nyblade et al., 2019). Addressing these social drivers requires community-level strategies, including anti-stigma campaigns and peer support networks. Misconceptions about ART efficacy were another important finding patients who doubted ART's effectiveness had significantly higher odds of non-adherence, reinforcing the need for consistent, high-quality counseling to dispel myths and sustain trust in treatment.

Routine integration of ART emerged as a protective factor, supporting the importance of practical adherence strategies. Patients who struggled to incorporate ART into daily routines had dramatically higher odds of non-adherence. This finding points to the need for personalized adherence counseling, support for habit formation, and structural interventions such as peer-led adherence clubs, mobile reminder systems, or treatment supporters tailored to local contexts. Interestingly, while setting alarms was examined as a potential adherence aid, it did not significantly affect adherence outcomes in this study. This suggests that simple reminder tools alone may be insufficient without broader behavioral support addressing stigma, knowledge, and daily life integration.

Limitations

This study has several limitations. Its cross-sectional design limits causal inference, as it cannot establish the temporal direction of observed associations. Reliance on self-reported data introduces risks of recall bias and social desirability bias, potentially leading participants to underreport non-adherence or sensitive factors such as stigma. Additionally, although the study adjusted for several confounders in regression analysis, unmeasured factors such as mental health status or substance use patterns may still influence adherence and were not fully captured. Finally, findings from Kibungo Referral Hospital may not generalize to all regions in Rwanda or similar settings without consideration of local socio-economic and cultural differences.

Policy and Practice Implications

Addressing ART non-adherence in Kibungo requires multi-level strategies. Health centers should prioritize youth-friendly services, including peer mentoring and counseling specifically designed for younger patients. Education-based interventions are critical to improve health literacy among those with limited formal education. Anti-stigma efforts must go beyond clinic walls, leveraging community health workers, local leaders, and media to reshape attitudes and reduce discrimination. Practical adherence support should emphasize personalized treatment planning, routine integration coaching, and combined behavioral interventions that go beyond simple reminders. Policymakers should also invest in strengthening primary healthcare infrastructure, training providers in culturally sensitive counseling, and ensuring reliable ART supply chains to sustain high adherence rates.

Conclusion

This study highlights that while Kibungo Referral Hospital demonstrates relatively strong ART adherence rates compared to many regional contexts, non-adherence remains a meaningful challenge driven by age, educational attainment, stigma, misconceptions about ART efficacy, and difficulties in integrating treatment into daily routines. Addressing these factors requires coordinated efforts among healthcare providers, policymakers, and communities to implement targeted, culturally informed, and evidence-based strategies. Strengthening patient education, reducing stigma, and supporting routine integration can improve treatment outcomes, advance Rwanda’s progress toward its HIV control goals, and contribute to the broader aim of ending AIDS as a public health threat by 2030.

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