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Vulnerabilities and Resilience Processes in Adherence to Antiretroviral Therapy

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Abstract: Antiretroviral Therapy has reduced HIV morbidity and mortality. However, its benefits depend on adherence to treatment. The objective was to investigate the factors associated with adherence to antiretroviral medications by people living with HIV. The study was conducted with 237 adults, including adults and the elderly, using: Characterization questionnaire; Depression, Anxiety and Stress Scale; Resilience Assessment Scale; Duke Religiosity Index; Spirituality Self Rating Scale, and Questionnaire to assess adherence to antiretroviral treatment. Descriptive and inferential statistical analyses were performed. Of the participants, 72.6% were considered adherent. Symptoms of anxiety, increased frequency of alcohol consumption, and illicit drug use increased the odds of non-adherence, while resilience had a positive impact on adherence. The findings highlighted the impact of mental health on adherence and can guide the design of interventions that more effectively consider this dimension in the care of this group.

Keywords: HIV, treatment adherence, antiretroviral therapy, health vulnerability, resilience

Vulnerabilidades e Processos de Resiliência na Adesão à Terapia Antirretroviral

Resumo: A Terapia Antirretroviral diminuiu a morbimortalidade pelo HIV. Contudo seus benefícios dependem da adesão ao tratamento. Objetivou-se investigar os fatores associados à adesão aos medicamentos antirretrovirais por pessoas vivendo com HIV. O estudo foi realizado com 237 pessoas, entre adultos e idosos, utilizando: Questionário de caracterização; Escala de Depressão, Ansiedade e Estresse; Escala de Avaliação de Resiliência; Índice de Religiosidade Duke; Spirituality Self Rating Scale e Questionário para avaliação da adesão ao tratamento antirretroviral. Foram realizadas análises estatísticas descritivas e inferenciais. Foram considerados aderentes 72,6% dos participantes. Sintomas de ansiedade, maior frequência do consumo de bebidas alcoólicas e uso de drogas ilícitas aumentaram as chances da não adesão, enquanto a resiliência teve um impacto positivo sobre a adesão. Os achados evidenciaram o impacto da saúde mental na adesão, podendo orientar o delineamento de intervenções que considerem de modo mais efetivo essa dimensão no cuidado a esse grupo.

Palavras-chave: HIV, adesão ao tratamento, terapia antirretroviral, vulnerabilidade em saúde, resiliência

Vulnerabilidades y Processos de Resiliencia en la Adherencia a la Terapia Antirretroviral

Resumen: La terapia antirretroviral ha reducido la morbimortalidad por VIH. Sin embargo sus beneficios dependen de la adherencia al tratamiento. El objetivo fue investigar los factores asociados con la adherencia a los medicamentos antirretrovirales por parte de personas que viven con VIH. El estudio se realizó con 237 personas, entre adultos y ancianos, mediante: cuestionario de caracterización; Escala de Depresión, Ansiedad y Estrés; Escala de Evaluación de Resiliencia; Índice Religiosidad de Duke; *Spirituality Self Rating Scale* y Cuestionario para la evaluación adherencia al tratamiento antirretroviral. Se realizaron análisis estadísticos descriptivos e inferenciales. Se consideró que el 72,6% de los participantes eran adherentes. Síntomas de ansiedad, y mayor frecuencia de consumo de alcohol y de drogas ilícitas aumentaron las posibilidades de incumplimiento, mientras que la resiliencia tuvo un impacto positivo en el cumplimiento. Los hallazgos evidenciaron el impacto de la salud mental en la adherencia, lo que puede orientar el diseño de intervenciones que consideren de manera más efectiva esta dimensión en la atención de este grupo.

Palabras clave: VIH, adherencia al tratamento, terapia antiretroviral, vulnerabilidad en salud, resiliencia

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HIV/AIDS infection remains a major global public health problem. Globally, by 2023, an estimated 39.9 million people living with HIV (PLHIV) (United Nations Programme on HIV/AIDS [UNAIDS], 2023). In Brazil, from 1980 to June 2024, 1,165,599 cases of AIDS were registered (Ministério da Saúde, 2024).

In recent decades, the availability of antiretroviral therapy (ART) has resulted in a substantial decline in infection-related morbidity and mortality. ART has developed the potential to transform AIDS into a chronic condition with potential for control. Among the main objectives of ART are the control of HIV progression and its sexual transmission through viral suppression (Tchakoute et al., 2022).

The benefits of ART, however, are not achieved if there is no adherence to treatment, and its effectiveness necessarily depends on lifelong adherence (Seidl & Remor, 2020). Adherence to a medication involves taking it at the prescribed dose and frequency, being procedural, complex, and multi-determined (Carvalho et al., 2022). Non-adherence to ART is the most frequent cause of virological failure and is responsible for the development of drug resistance, resulting in a reduction in therapeutic regimen options and a detriment to individuals' quality of life, as well as implications for public health with the spread of resistant viruses (Ministério da Saúde, 2018).

There is still no consensus on the definition of good and poor adherence. Early studies on the topic described that at least 95% adherence to treatment was necessary to maintain an undetectable HIV viral load; however, more recent studies indicate that potent antiretroviral regimens can maintain viral suppression at moderate adherence rates, below 95% (Carvalho et al., 2022; Tchakoute et al., 2022).

New intervention technologies related to HIV/AIDS have been used to combat the epidemic, among them are the Treatment as Prevention and Treatment for All protocols, which are part of the Combined HIV Prevention model, supported by robust evidence that people living with HIV (PLHIV), when on treatment and with an undetectable viral load for at least six months, do not transmit the virus, highlighting the importance of adherence to antiretrovirals in controlling HIV/AIDS (Ministério da Saúde, 2018; Seidl & Remor, 2020; UNAIDS, 2023). Continuous monitoring of the 95/95/95 targets proposed by UNAIDS is added, in which one of the objectives is adherence, to which Brazil is a signatory, in which countries must achieve by 2030: 95% of PLHIV diagnosed, 95% of PLHIV diagnosed using ART, and 95% of PLHIV on ART with viral suppression (Ministério da Saúde, 2024; Tchakoute et al., 2022; UNAIDS, 2023).

There is evidence that multiple factors are associated with adherence and its heterogeneous and regional nature, which can be summarized in sociodemographic characteristics; psychosocial factors; treatment characteristics; characteristics of HIV/AIDS infection; relationship with health services, and social support (Arrieta-Martínez et al., 2022; Aytenew et al., 2024; Carvalho et al., 2022). Among the aspects that facilitate adherence, the following stand out: resilience processes, religiosity/spirituality (R/S), feelings of self-worth of PLWHA, positive perception of ART, acceptance of seropositivity, use of strategies to remember to take the medication, understanding the need for high levels of adherence and guarantee of basic social rights such as income, health and education (Brito & Seidl, 2019; Ministério da Saúde, 2018; Seidl & Remor, 2020; UNAIDS, 2023; Wen et al., 2021).

Among the factors that hinder adherence, studies point to the presence of psychopathological symptoms, given that PLWHA have a greater chance of mental health problems, with the risk being two to four times greater than that of the general population (Guzmán-Mendoza et al., 2025; Haas et al., 2023; Lee et al., 2022). Other obstacles include negative body image, excessive alcohol consumption, abuse of psychoactive substances, forgetting to take medication, lack of understanding of the benefits of treatment, lack of information about the risks of non-adherence, complicated medication regimens, difficulty accessing health services, low education levels, food insecurity, and experiences of HIV/AIDS-related vulnerabilities (Arrieta-Martínez et al., 2022; Aytenew et al., 2024; Haas et al., 2023; Kalichman et al., 2019; Ministério da Saúde, 2018; Starks et al., 2020; UNAIDS, 2023).

To understand adherence to antiretrovirals and its associated factors, it is necessary to consider the wholeness of the human being, which is constituted by the biopsychosocial and spiritual dimensions. The experience of HIV/AIDS is permeated by structural, cultural, political, social, and psychological vulnerabilities, stigmatizing and discriminatory processes, social and gender inequalities, among others, which have a significant impact on the health of this population, which must constantly adapt and deal with the challenges of its condition. In this scenario, resilience resources and the R/S dimension stand out (Brito & Seidl, 2019; Carvalho et al., 2023; Seidl & Remor, 2020; Wen et al., 2021).

Resilience is a complex and procedural phenomenon, understood as a person's ability to recover and become stronger in the face of adversity. In the literature reviewed, resilience processes are indicated as a dimension that allows for better adaptation to HIV positivity, in addition to being associated with better adherence and better disease progression (Binhardi et al., 2023; Carvalho et al., 2023; Emílio & Martins, 2012; Seidl & Remor, 2020; Wen et al., 2021). Also considered a protective factor, R/S can contribute to promoting resilience, given that life purpose, beliefs, and religious practices are presented as a resource for coping with stressors in the experience of HIV (Brito & Seidl, 2019). The term R/S has been commonly found in health research with the purpose of a more comprehensive discussion that contemplates the specificities of the concepts of religion, religiosity, spirituality, and ancestry (Brito & Seidl, 2019; Gonçalves & Pillon, 2009; Taunay et al., 2012).

Although studies on ART adherence levels have increased over the last decade, research on this topic in Brazil is still relatively new, with a scarcity of studies covering the factors associated with it. Furthermore, there is a lack of information on adherence in several regions, particularly in the interior of the country, information that is crucial for better defining the overall picture of the epidemic in Brazil (Carvalho et al., 2022).

There is also a need to investigate adherence in emergency contexts, such as the COVID-19 pandemic, given the possible compromise in access to health services during this period (Wagner et al., 2021).

Considering the comprehensive view of PLHIV and the factors associated with ART adherence reported in national and international studies (Arrieta-Martínez et al., 2022; Aytenew et al., 2024; Carvalho et al., 2023; Guzmán-Mendoza et al., 2025; Haas et al., 2023; Kalichman et al., 2019; Ministério da Saúde, 2018; Seidl & Remor, 2020; UNAIDS, 2023; Wagner et al., 2021; Wen et al., 2021) some questions guided the development of the study objective: (a) What is the level of adherence to ART of the participants, users of a public health service in the interior of the country? (b) Are the general characteristics of the participants (demographic and socioeconomic aspects; clinical aspects; acceptance of the diagnosis; satisfaction with body image; social support and alcohol consumption, illicit drugs, and tobacco) associated with the level of adherence to ART? (c) Are the repercussions of the COVID-19 pandemic, in effect, when the study was conducted, associated with ART adherence? (d) Are negative psychological variables, such as the presence of symptoms of depression, anxiety, and stress, associated with ART adherence? (e) Are positive psychological variables, such as resilience and R/S, associated with ART adherence? Given this scenario, the objective of this study was to investigate the factors associated with adherence to antiretroviral medications by PLHIV.

Method

Participants

This is a cross-sectional, descriptive, and inferential study. Participants were 237 people living with HIV (PLHIV) over 18 years of age, aged 23 to 77, treated at a public outpatient referral health service for infectious diseases in a medium-sized city in the state of Minas Gerais, Brazil. The inclusion criteria were: (a) age 18 years or older; (b) confirmed diagnosis of HIV infection, undergoing clinical follow-up at the service; and (c) prescribed ART for a period of six months or longer. The exclusion criteria were: (a) being pregnant; and (b) being imprisoned in a closed prison.

Sample size calculations used data from the Medication Logistics Control System, which gathers information on ART dispensing. The sample size was determined based on statistical criteria using the known population. Considering the prevalence of non-adherence of 30%, 95% confidence, and 5% error, the sample size was set at 235 people.

Instruments

Structured questionnaire for participant characterization: developed specifically for this study, containing 44 closed-ended questions on: (a) demographic and socioeconomic aspects; (b) clinical aspects (time since diagnosis and time in treatment); (c) body image; (d) living with HIV infection; (e) social support; (f) alcohol consumption, illicit drugs, and tobacco; and (g) repercussions of the COVID-19 pandemic, including access to services and medication in this context.

Data on date of birth, age, comorbidities, HIV/AIDS-associated infections, CD4 count, plasma viral load, psychiatric diagnosis, use of psychiatric medications, and use of other medications were obtained through access to participants' medical records. This information was verified using a structured script after the interview.

Depression, Anxiety and Stress Scale - DASS-21: constructed by Brown et al. (1997) and validated for Brazil by Vignola &Tucci (2014). This scale consists of 21 items divided into three subscales that assess the presence of symptoms of depression, anxiety, and stress, with 4-point Likert-type responses. Cutoff points indicate normal condition, mild, moderate, severe, and extremely severe symptoms. The single Cronbach's alpha was .95 in the present sample, with Cronbach's alpha for the depression subscale being .93, for the anxiety subscale being .82, and for the stress subscale being .90, indicating a good level of reliability for the scale and subscales.

Resilience Assessment Scale (Escala de Avaliação de Resiliência) - RAS: resilience assessment instrument developed and validated in the Brazilian context by Emílio and Martins (2012). It has 32 items grouped into five factors: F1-positive acceptance of change, 10 items; F2-spirituality, 6 items; F3-resignation, 7 items; F4-personal competence, 5 items; F5-persistence in the face of difficulties, 4 items. Responses are given on a 5-point Likert scale. The scale also provides a global resilience index, whose Cronbach's alpha was .73 in this study, with Cronbach's alpha in F1 being .83, in F2 .78, in F3 .56, in F4 .75, and in F5 .66. On this scale, the higher the participant's mean, the more characteristic the factor or global index. Participants were asked to respond to the scale considering their own situation living with HIV (Brito & Seidl, 2019).

Duke Religiousness Index - DUREL: a 5-item scale, constructed by Koenig and Büssing (2010) and validated for Brazil by Taunay et al. (2012), which measures three dimensions of religious involvement related to health outcomes: organizational religiosity (OR) measured by item 1; non-organizational religiosity (NOR) measured by item 2; and intrinsic religiosity (IR) measured by items 3, 4, and 5. On this scale, the higher the participant's average score, the more characteristic the dimension under analysis. Cronbach's alpha for the scale in the study sample was 0.81.

Spirituality Self Rating Scale – SSRS: constructed by Galanter et al. (2007) and translated and validated by Gonçalves and Pillon (2009), comprising 6 items that use a Likert scale to assess spirituality, with scores ranging from 6 to 30 points. This scale aims to assess aspects of an individual's spirituality based on what they consider important, listing their level of spiritual orientation, and the greater the person's average score, the more characteristic the dimension under analysis is. Cronbach's alpha was .72 in the present study.

Questionnaire for assessing adherence to antiretroviral treatment - CEAT-VIH, developed and validated for Brazil by Remor et al. (2007). Its current version contains 17 items that assess adherence to ART through self-report. The CEAT-VIH establishes the following degree of overall adherence: low/insufficient adherence, good/adequate adherence, or strict adherence. For analysis, the scores were grouped into two groups: adequate or good/strict adherence and inadequate or low/insufficient adherence. Cronbach's alpha for the present sample was .90, indicating a good level of reliability for the instrument.

Procedures

Data collection. The sample was consecutive, initially checking the electronic medical records of users scheduled for that day and, of those, which ones met the inclusion criteria. The invitation to participate in the study was made individually while the person was waiting for their medical appointment. Upon agreement, the Free and Informed Consent Form (FICF) was read beforehand, and their signature was requested to begin the application of the instruments. To verify the adequacy of the instruments, a pilot application was initially conducted with five service users living with HIV. After adjusting the questionnaire for clarity and fluency, the final data collection began, conducted throughout 2021, during the COVID-19 pandemic. The questionnaires were administered through individual interviews in private service rooms, protecting the privacy and confidentiality of the participants. At the end of the interview, clinical data were verified in the electronic medical record.

Data analysis. Descriptive and inferential statistical analyses were performed using SPSS software, version 23. Statistical analyses of internal consistency of the standardized instruments demonstrated their suitability for subsequent statistical analyses.

Initially, descriptive analyses were performed with frequency distribution and percentage of categorical variables and measures of central tendency (mean and median) and dispersion (standard deviation, minimum, and maximum values) of continuous variables. Data normality was assessed using the Kolmogorov-Smirnov test. The results showed that the variable adherence to ART was not normally distributed (K-S (237)=0.456, p<.001).

Univariate binary logistic regression analyses were then performed to assess possible relationships between the variables of interest, followed by multivariate logistic regression, which was conducted using the enter method. This analysis aimed to investigate the extent to which adherence to ART (no or yes) could be adequately predicted by the study variables of interest, with only those variables that were statistically significant ($p < .05$) remaining in the final explanatory model.

For the models, the odds ratio, 95% confidence interval, and significance of the variables were estimated. The final regression model was chosen considering the explanatory value of the model (measured by R^2) and the regression fit, measured by the Hosmer-Lemeshow test.

Ethical considerations

This study was approved by the Research Ethics Committee of the *Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo*, CAAE No. 08064919.7.0000.5393, and the *Hospital de Clínicas da Universidade Federal do Triângulo Mineiro*, CAAE No. 08064919.7.3001.8667. Participants were informed about the bioethical principles, as well as the objectives and procedures of the study when invited to voluntarily participate in the research, having signed the FICF.

Results

General characterization of participants

A total of 237 PLHIV were interviewed. Regarding the demographic and socioeconomic characteristics presented in Table 1, the majority of participants were women, with 4.2% being trans women. The average age of the interviewees was 46.9 years (*SD* + 12.2), of which 47.3% were between 30 and 49 years old and 43.9% were over 50 years old. Black and brown people, with incomplete or complete elementary education, low family income, heterosexual, and religious beliefs predominated; however, 35.4% did not practice any religion.

Regarding the clinical data (Table 1), 35.0% of the participants had been infected for 10 to 20 years. The majority had been prescribed ART for more than 10 years, had morbidities and opportunistic infections associated with HIV, had an undetectable viral load and a CD4 count greater than 500 cells/mm³, with an average of 649 cells/mm³, ranging from 4 cells/mm³ to 2,352 cells/mm³. When considering the adherence measure assessed by CEAT, 72.6% of interviewees were considered adherent to ART.

Table 1

Frequency distribution of demographic, socioeconomic, clinical, and ART adherence variables (N = 237)

Variables	*N*	%
a. Demographic and socioeconomic		
Gender		
Cisgender Man	115	48.5
Cisgender Woman	112	47.3
Transgender Woman	10	4.2
Age		
18 to 24 years old	6	2.5
25 to 29 years old	15	6.3
30 to 49 years old	112	47.3
50 to 60 years old	71	30.0
Equal to or greater than 60 years old	33	13.9

Continue...

Table 1

Continuation

Variables	*N*	%
Color		
Brown	84	35.2
Black	75	31.6
White	78	32.9
Education level		
None	9	3.8
Incomplete elementary education	111	46.8
Complete elementary education	38	16.0
Incomplete high school education	15	6.3
Complete high school education	44	18.6
Incomplete higher education	8	3.4
Complete higher education	12	5.1
Family income		
No income	4	1.7
Up to R$522	8	3.4
From R$522 to R$2089	147	62
From R$ 2089 to R$ 4177	61	25.8
Above R$ 4177	17	7.2
Religious or spiritual belief		
Yes	233	98.3
No	4	1.7
b. Clinical aspects		
Time of knowledge of HIV diagnosis		
Up to 1 year	11	4.6
1 to 5 years	41	17.3
5 to 10 years	57	24.1
10 to 20 years	83	35.0
Over 20 years	45	19.0
Time of ART prescription		
6 months to 1 year	12	5.1
1 to 5 years	48	20.3
5 to 10 years	51	21.5
Over 10 years	126	53.2
CD4		
Less than 200 cells/mm³	23	9.7
Between 201 and 350 cells/mm³	29	12.2
Between 351 and 500 cells/mm³	43	18.1
Above 500 cells/mm³	142	59.9
Viral load		
Undetectable	195	82.3
Fewer than 1,000 copies	14	5.9
Greater than 1,000 copies	28	11.8
Adherence to ART		
Insufficient adherence	65	27.4
Adequate and strict adherence	172	72.6

Regarding body image, the majority (71.3%) were satisfied with their appearance. When asked about HIV acceptance, most of the sample stated that they accepted their diagnosis (66.2%) and lived well with it (73.0%), with 96.6% reporting that they had shared their HIV status with someone. 60.8% said they had received support from someone in practical situations, facilitating their treatment, and 64.1% said they had received social support for emotional issues related to living with HIV/AIDS infection. As for alcohol consumption, the majority (51.9%) said they had consumed alcohol at least once in the last six months, while 87.9% reported not having used illicit drugs and 65.4% reported not having used tobacco.

In this sample, 82.7% of participants reported not having had COVID-19 infection. However, 48.9% reported feeling worried or very worried about their own health during the pandemic, and 54.0% reported feeling worried about their financial situation during the pandemic. Still related to the pandemic, 51.9% of the interviewees stated that they felt more anxious, 45.6% more stressed, and 43.0% sadder. Most people reported having no difficulty scheduling appointments (97.5%), traveling to the service (96.2%), and picking up their HIV medication (98.7%).

Emotional conditions, resilience, and R/S: descriptive analysis

Table 2 presents the emotional conditions of the participants, based on the results of the DASS-21.

Participants generally showed good levels of resilience. On the DUREL religiosity index and the SRSS scale, the interviewees also showed good levels of R/S. These data are summarized in Table 3.

Factors associated with adherence to ART

The variables that showed a significant relationship with adherence in the bivariate analyses were included in the initial

Table 2

Frequency distribution of variables related to participants' emotional conditions (N = 237)

Variable	*N*	%
Symptoms of Depression		
Normal	77	32.5
Mild and moderate	83	35.1
Severe and extremely severe	77	32.5
Anxiety symptoms		
Normal	130	51.7
Mild and moderate	35	14.8
Severe and extremely severe	71	30.1
Symptoms of stress		
Normal	122	51.7
Mild and moderate	29	12.3
Severe and extremely severe	85	36.1

Table 3

Averages, standard deviations, minimum and maximum values of the RAS, DUREL, and SSRS scales (N = 237)

Scales	Average	Standard Deviation	Minimum	Maximum
Resilience Assessment Scale (RAS)				
Spirituality	3.59	0.74	0.0	4.0
Persistence in the face of difficulties	3.53	0.80	0.0	4.0
Positive acceptance of change	3.48	0.68	0.0	4.0
Resignation	2.54	0.78	0.6	4.0
Personal Competence	2.47	1.08	0.0	4.0
Resilience (total score)	3.12	0.61	0.39	4.0
Religiosity Index (DUREL)				
Organizational Religiosity (OR)	3.22	1.97	1.0	6.0
Non-Organizational Religiosity (RNO)	4.43	1.66	1.0	6.0
Intrinsic Religiosity (IR)	9.99	3.83	3.0	15.0
Spirituality Self Ranting Scale - SRSS (total score)	22.74	5.86	6.0	30.0

model, namely: education level, number of people with whom the participant lived, own income, acceptance and coexistence with the condition of living with HIV, satisfaction with body image, frequency of alcohol consumption, use and frequency of illicit drugs, use and frequency of tobacco, support in concrete situations facilitating the use of medication and living with HIV, financial concern and stress experienced during the pandemic, symptoms of depression, anxiety and stress, the factors of the resilience scale and global resilience, the dimensions of RS measured by the DUREL index.

Multilevel logistic regression analysis was used to investigate the factors associated with adherence to antiretrovirals; predictor variables were selected based on the results of the bivariate analysis. The explanatory models were reduced, leaving only those with significant variables. The regression model was statistically significant [$x^2(8) = 102.899$, $p < .001$; Nagelkerke $R^2 = .511$], being able to accurately predict 84.7% of cases (with 58.5% of cases correctly classified as non-adherent and 94.7% of cases correctly classified as adherent).

The final model that best explained adherence is presented in Table 4. Of all the predictors investigated, the personal competence resilience factor had a positive impact on adherence. Higher frequency of alcohol consumption, illicit drug use, and anxiety symptoms increased the odds of nonadherence.

Discussion

This study sought to assess the factors associated with adherence to antiretroviral therapy in PLHIV. Participants were initially characterized, which was consistent with the epidemiological profile of the infection in the country (Ministério da Saúde, 2024), although, in this study, the majority were women.

The predominance of people who declared themselves black and brown, with low family income and low education levels, points to the phenomenon known as the pauperization of the HIV/AIDS epidemic, in which a greater number of cases are concentrated in people with low income and low education levels, in addition to persisting large disparities by race/ethnicity, highlighting the importance of research into the social determinants of health and public policies that prioritize populations with greater vulnerability to the virus (UNAIDS, 2023).

In the context of HIV/AIDS, actions must be guided by comprehensive and humanized health care, and monitoring medication adherence and the factors related to this complex process is essential. In this study, 72.6% of participants were considered to have good adherence levels, according to the CEAT questionnaire. Similar results were found in Brazilian studies using the same questionnaire (Carvalho et al., 2022). However, there were findings in which adherence, also assessed by CEAT, was both higher and lower (Goulart et al., 2018; Moraes et al., 2021), when compared to the present study. This diversity in adherence levels across studies highlights the heterogeneous nature of this process and the multiplicity of socioeconomic and cultural aspects that may influence it, as well as the need for research on this topic in different contexts (Arrieta-Martínez et al., 2022; Carvalho et al., 2022; Tchakoute et al., 2022).

When assessing factors associated with ART adherence, the presence of anxiety symptoms decreased the odds of adherence. It is noteworthy that although the results also indicated that the majority of interviewees presented symptoms of depression, these were not predictors of adherence. Similar findings were found in a study conducted in Mexico with 442 participants, in which anxiety was strongly associated with low adherence (Guzmán-Mendoza et al., 2025).

It is observed that PLHIV are more likely to present symptoms of anxiety, stress and depression (Guzmán-Mendoza et al., 2025; Lee et al., 2022). Receiving a positive HIV diagnosis can still be considered a stressful and traumatic event in a person's life. Even with advances in treatment, there is still no cure for the disease, which unfortunately remains shrouded in stigma,

Table 4

Logistic regression analysis results: final model

Variable	*Exp(B)*	*CI* 95%	*p-value*
Frequency of alcohol consumption	0.48	0.29-0.78	.049
Use of illicit drugs	0.03	0.00-0.98	.049
Presence of anxiety symptoms	0.38	0.15-0.90	.029
The resilience factor of personal competence	1.57	1.07-2.30	.019

Note. *Exp(B)* (odds ratio); *CI* (Confidence interval); $p < .05$

prejudice, and social, emotional, and sexual discrimination (Cazeiro et al., 2021; Wen et al., 2021). In responding to infection, it is necessary to look not only at biomedical issues, but also to be aware of the intersection of structural, cultural, socioeconomic, and psychological factors in living with HIV, which must be considered in the care of PLHIV, which reinforces the importance of mental health care and combating stigmatizing and discriminatory processes among this population.

It is important to highlight that this study was carried out in an emergency situation, during the Covid-19 pandemic, a time when Brazilians were experiencing a large increase in the number of fatal victims, when the vaccination program was beginning, a period still of great uncertainty and anguish, with economic and biopsychosocial repercussions, which tended to become more intense due to prolonged social isolation, fear of coronavirus infection, frustrations, material and financial insufficiency (Binhardi et al., 2023; Wagner et al., 2021). Although the results of this study do not indicate that the pandemic affected adherence to ART, which corroborates the findings of Wagner et al. (2021), they point to the need for monitoring and interventions aimed at the well-being of PLHIV in emergency contexts, given its impact on the emotional conditions of this group.

In this study, the higher frequency of alcohol consumption and illicit drug use decreased the odds of adhering to ART, similar findings were found in the Starks et al. (2020) study. Alcohol and substance use and dependence have been associated with mental illness, as well as worsening health conditions among PLHIV (Lee et al., 2022; Starks et al., 2020).

Alcohol consumption, although highly socially acceptable, has been associated with non-adherence and can have negative psychosocial repercussions related to health, behavior, and relationships. In this context, it is important to adopt harm reduction measures for PLHIV. These strategies should aim to reduce alcohol consumption to improve treatment engagement and the adoption of healthier lifestyle habits, as well as directly address beliefs about the interactive toxicity between alcohol and ART. Interventions should provide clear guidance, emphasizing the importance of taking ART even when using alcohol (Kalichman et al., 2019).

Such measures can also be applied to people using illicit drugs. In addition to being a predictor of non-adherence, people who use illicit drugs, especially abusively, can often find themselves in situations of multiple vulnerabilities and stigmatization (Tostes et al., 2020). In addition to that related to HIV/AIDS, they may present emotional illness, food and housing insecurity, difficulty accessing health care, difficulty understanding treatment, and adopting measures for safe sexual practices. The clinical management of illicit drug users living with HIV and the comprehensive health care of this population constitute a major challenge for health services and should be prioritized and carried out in a network (Goulart et al., 2018; Tostes et al., 2020).

Participants achieved good R/S and resilience scores. However, only resilience was among the variables predicting adherence, corroborating findings from previous studies that associated ART adherence and resilience (Seidl & Remor, 2020; Wen et al., 2021). In the context of HIV/AIDS, there are still few studies on this topic, although resilience plays an important role in this group, given that it permeates people's lives and can be a protective factor for overcoming adversity by reaffirming individuals' ability to face and overcome difficult situations. Furthermore, it allows for better acceptance of the conditions of chronic illness, preventing impacts on mental health (Binhardi et al., 2023; Carvalho et al., 2023).

Wen et al. (2021) observed in their study with PLHIV that resilience increased the odds of adherence to ART and better mental health among participants, and that self-esteem, self-efficacy, and social support, in turn, contributed to increased resilience, pointing to the need for interventions focused on resilience and the factors for its development. However, there is a notable scarcity of validated instruments to assess this construct for PLHIV, representing a gap in this theme. It is also important to highlight the importance of research and interventions that prioritize protective factors for the health of PLHIV, such as resilience and R/S, and that the results are incorporated into clinical settings, given that these factors can mediate the health-disease process (Brito & Seidl, 2019; Carvalho et al., 2023).

In the present study, symptoms of anxiety, the frequency of alcohol consumption, and illicit drug use decreased the odds of adherence, while aspects of resilience were associated with greater adherence, an outcome that highlights the impact of mental health on adherence to antiretrovirals. Even with advances in infection management, PLHIV still face many challenges, with the occurrence of mental health problems being greater in this population, whose existence is affected by biomedical, psychosocial, political, and structural factors (Lee et al., 2022). It is essential to implement evidence-based adherence interventions that address mental health, as well as studies that assess interventions to improve adherence.

Some limitations should be noted. This study was based on a cross-sectional design, using the *enter* method for data analysis, which does not allow for inferring causality for the associations found or effects between the variables. For the RAS instrument, the overall Cronbach's alpha was .73. However, the alphas for the five factors ranged from .56 to .83. Although a validated questionnaire was used to measure adherence, it relies on self-reporting, which may contribute to recall and social desirability bias. Future research with different designs and population samples could help address these gaps.

These results may contribute to the implementation of evidence-based interventions in health services to improve adherence to antiretroviral therapy, as well as to support actions to welcome and promote mental health among PLHIV. In addition, they may highlight the importance of addressing vulnerabilities to HIV/AIDS and combating stigma and prejudice related to infection, which still affect the lives of this group.

Data Availability

The study dataset is not publicly available, as it contains information about services and processes that allow the identification of respondents, as well as the locations where the participants were located.

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