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ORIGINAL PAPER

Psychosocial factors influencing treatment adherence in Brazilian gay men living with HIV

Fatores psicossociais que influenciam a adesão ao tratamento em homens gay brasileiros vivendo com HIV

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Abstract

Context and Aim: Adherence to antiretroviral treatment (ART) among men who have sex with men (MSM) living with HIV poses a public health challenge. Although studies in developed countries emphasize the role of psychosocial factors in ART adherence, there is limited research on this association among Brazilian MSM living with HIV. This study examined the impact of depression, anxiety, internalized homonegativity, and HIV-related stigma on ART adherence in a sample of this population. **Method**: A cross-sectional study recruited 43 MSM living with HIV (M_{age} = 34.93, *SD* = 7.90) through social media. Instruments included sociodemographic and clinical questionnaires, the Questionnaire for Assessment of Adherence to Antiretroviral Treatment, the Beck Depression Scale, the Trait-State Anxiety Inventory, the Internalized Homophobia Scale, and the HIV Stigmatization Scale. **Results**: Twelve participants (27.9%) showed inadequate ART adherence, and 18 (41.8%) reported signs and symptoms of depression at clinical level. Depression was negatively and moderately correlated with ART adherence. HIV-related stigma was positively and moderately correlated with depression, trait anxiety, and homonegativity. Depression significantly impacted ART adherence, explaining 13.4% of the variance. **Conclusions:** Our results highlight the need for regular depression screening and affirmative interventions to support MSM living with HIV, addressing stigma, and promoting adherence to ART.

Keywords: Depression; Male Homosexuality; Homonegativity; HIV-Related Stigma; Medication Adherence; Psychopathology; Social Stigma; Cross-sectional Study.

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Resumo

Contexto e Objetivo: A adesão ao tratamento antirretroviral (TARV) entre homens que têm sexo com homens (HSH) vivendo com HIV representa um desafio para a saúde pública. Embora estudos realizados em países desenvolvidos enfatizem o papel dos fatores psicossociais na adesão ao TARV, há uma investigação limitada sobre essa relação entre HSH brasileiros vivendo com HIV. Este estudo examinou o impacto da depressão, ansiedade, homonegatividade internalizada e estigma relacionado ao HIV na adesão ao TARV numa amostra dessa população. **Método**: Um estudo transversal recrutou 43 HSH vivendo com HIV (M_{idade} = 34,93, *DP* = 7,90) através das redes sociais. Os instrumentos incluíram questionários sociodemográficos e clínicos, o Questionário de Avaliação da Adesão ao Tratamento Antirretroviral, a Escala de Depressão de Beck, o Inventário de Ansiedade Traço-Estado, a Escala de Homofobia Internalizada e a Escala de Estigmatização do HIV. **Resultados:** Doze participantes (27,9%) mostraram adesão inadequada ao TARV, e 18 (41,8%) relataram sinais e sintomas de depressão em nível clínico. A depressão correlacionou-se negativamente e de forma moderada com a adesão ao TARV. O estigma relacionado ao HIV correlacionou-se positivamente e de forma moderada com a depressão, ansiedade traço e homonegatividade. A depressão influenciou significativamente a adesão ao TARV, explicando 13,4% da variância. **Conclusões:** Os nossos resultados destacam a necessidade de rastreio regular da depressão e de intervenções afirmativas para apoiar HSH vivendo com HIV, abordando o estigma e promovendo a adesão ao TARV.

Palavras-Chave: Depressão; Homossexualidade Masculina; Homonegatividade; Estigma relacionado ao HIV; Adesão à Medicação; Psicopatologia; Estigma Social; Estudo Transversal.

Introduction

Human Immunodeficiency Virus (HIV) infection is a complex condition that can progress to Acquired Immunodeficiency Syndrome (AIDS) (Ministério da Saúde, 2020; World Health Organization, WHO, 2017). As of 2018, approximately 37.9 million individuals globally were living with HIV (United Nations Program [UNP], 2022). Since the onset of the HIV epidemic in the 1980s, around 36.3 million people have died from AIDS-related illnesses (UNP, 2022).

In 2013, international guidelines aimed to control the pandemic by 2020, with the ultimate goal of eradication by 2030. These guidelines set ambitious targets: diagnosing 90% of all HIV cases, ensuring 90% of diagnosed individuals adhere to treatment, and achieving undetectable viral loads in 90% of those treated (UNP, 2020). However, in Brazil, these targets remain unmet (Ministério da Saúde, 2020; UNP, 2022). Research highlights the ongoing challenges in HIV and AIDS management, particularly among men who have sex with men (MSM)[1] (Calazans et al., 2018; Quinn & Voisin, 2020), a demographic experiencing a disproportionate impact from the infection. In this group, HIV incidence and prevalence have surpassed those in the general population, signaling a need for targeted interventions (Kerr et al., 2018).

[1] The term *men who have sex with men* (MSM) was originated in epidemiology as a broad concept that encompasses all men who engage in sexual activity with other men, regardless of their social identity (Boellstorff, 2011).

Global efforts over recent decades have led to significant progress in addressing the HIV pandemic. The development of more effective antiretroviral therapies (ART) with fewer adverse effects has reduced the physical complications associated with HIV and significantly improved the quality of life and life expectancy of individuals living with the virus (Marcus et al., 2020). However, poor patient adherence remains the leading cause of ART failure (Ministério da Saúde, 2020).

Adherence to ART is influenced by psychological factors, including the conscious and unconscious meanings assigned to illness and treatment, self-care behaviors, self-efficacy, and coping skills (Carvalho et al., 2019). Additionally, the presence of psychopathologies, such as Substance Abuse Disorder, Depressive Disorder, and Anxiety Disorders, whether pre-existing or reactive to an HIV diagnosis, can directly impact treatment adherence (Jang et al., 2020; Reis et al., 2010). Furthermore, studies indicate that ethnic and racial minorities, such as Black and Latin-American individuals, as well as those experiencing violence, trauma, and low income, tend to have suboptimal adherence to ART (Carvalho et al., 2019; Quinn & Voisin, 2020). For MSM, additional psychological factors influencing ART adherence include the meanings attributed to homosexuality, levels of homonegativity experienced in the community and internalized, and the stigma associated with HIV (Ortiz-Hernández et al., 2021a; Turan et al., 2019).

Brazilian studies have evaluated ART adherence within the general population (Capela et al., 2022; Foresto et al., 2017; Galvão et al., 2015; Menezes et al., 2018; Primeira et al., 2020), identifying various sociodemographic and clinical risk factors. However, research specifically targeting the MSM population remains limited, particularly studies exploring psychological factors that may affect the adherence process, such as HIV-related stigma, homonegativity, internalized homonegativity, and psychopathology.

Homonegativity is a broad term encompassing overtly violent behaviors as well as more subtle negative reactions and discriminatory beliefs about homosexuality. These can manifest as social isolation, verbal abuse, and/or symbolic violence (Morrison et al., 1997). The concept of homonegativity thus includes both explicit forms of discrimination and violence, as well as more subtle expressions of prejudice and symbolic aggression, often referred to as microaggressions (Archibald & Dunn, 2014; Morrison et al., 1997; Nadal et al., 2016). Research indicates that chronic exposure to homonegativity can lead homosexual individuals to internalize these negative beliefs, a process known as *internalized homonegativity* (Berg et al., 2016; Mayfield, 2001). Additionally, MSM living with HIV are affected by HIV-related stigma, which involves preconceived beliefs leading to devaluation, hostility, or social isolation, whether overt or covert, toward people living with HIV (Florom-Smith & De Santis, 2012; Rzeszutek et al., 2021).

Although international studies have shown the negative impact of community-perceived and internalized homonegativity, as well as HIV-related stigma, on ART adherence among MSM living with HIV (Bogart et al., 2010; Ortiz-Hernández et al., 2021a; Ortiz-Hernández et al., 2021b), no such

studies have been conducted in Brazil. A recent national study assessed internalized homonegativity and perceived social oppression related to homosexuality, revealing high levels of this form of prejudice (Alckmin-Carvalho et al., 2023a). Among participants, over 93% believed society punishes homosexuals, 98.6% believed discrimination against homosexuals is common, 22% expressed discomfort with thinking about their sexuality, and 22% preferred anonymous sexual encounters (Alckmin-Carvalho et al., 2023a).

Another study evaluated the perception of HIV-related stigma among Brazilian MSM HIV-positive (Alckmin-Carvalho et al., 2023b). The authors found a strong tendency for participants to perceive and internalize HIV-related stigma. A significant majority (72%–95%) reported efforts to hide their HIV status, viewing disclosure as risky and perceiving ostracism from the community toward people with HIV. These findings were further supported by a qualitative Brazilian study, which interviewed 15 MSM living with HIV (Alckmin-Carvalho et al., 2024). All participants reported experiences of sexual and HIV-related stigma, even in interactions with specialized HIV/AIDS health teams within the Brazilian public health system (Alckmin-Carvalho et al., 2024). While these studies did not specifically assess the impact of perceived homonegativity and HIV-related stigma on ART adherence among Brazilian MSM HIV-positive, it is reasonable to infer this association based on international literature (Bogart et al., 2010; Ortiz-Hernández et al., 2021a; Ortiz-Hernández et al., 2021b; Sweeney & Vanable, 2016).

Studies have shown that psychopathologies, whether pre-existing or reactive to an HIV diagnosis, can directly affect ART adherence in individuals living with the virus (Brown et al., 2019; Saraiva et al., 2010). A Portuguese study revealed a negative correlation between psychopathology and ART adherence, finding that higher levels of psychopathology were associated with lower adherence (Saraiva et al., 2010). Similarly, a Brazilian study examined the prevalence of depression and anxiety among people living with HIV, reporting a 12.6% prevalence of severe anxiety and 5.8% for depression. Anxiety, in particular, was a significant predictor of non-adherence to treatment (RH = 1.87; CI95% = 1.14–3.06) (Campos et al., 2008). Mental health issues are more prevalent among MSM living with HIV than among the general population (Bromberg et al., 2020; Lee et al., 2017; Meyer, 2003), and these psychopathologies can negatively affect self-care behaviors, including ART adherence (Ramos et al., 2024; Reis et al., 2010; Sulaiman et al., 2024). Given the heightened vulnerability of MSM to these mental health challenges, the relationship between psychopathology and ART adherence is likely even stronger in this population.

Building on the existing evidence, this study aimed to assess the impact of depression, anxiety, homonegativity, and HIV-related stigma on ART adherence among MSM living with HIV. We hypothesized that higher scores on depression, anxiety, homonegativity, and HIV-related stigma scales would be associated with lower ART adherence.

Method

This cross-sectional study was based on data from the pilot phase of the research project titled "Impact of Homophobia, Serological Stigma, and Psychopathologies on Adherence to Antiretroviral Treatment in Gay Men Living with HIV." The project was conducted at the School of Nursing, University of São Paulo, Brazil. Insights gained from the pilot phase were used to refine the methodology for this study, which was conducted at the same institution.

Participants

This study used a non-probabilistic sample, employing the snowball method for sample recruitment. This approach was chosen due to the sensitive and personal nature of the study, which involved the disclosure of HIV status and mental health variables. The first author contacted two nurses attending the master's and doctoral Programs at the School of Nursing, University of São Paulo, to indicate the initial five seed participants. Another five seed participants were recruited via social media platforms, such as Instagram and Facebook, using support or meeting pages for HIV Positive MSM. At the end of the online form, seed participants were asked: "Do you have any friends, gay or bisexual (or who have sex with men, even without identifying yourself as gay or bisexual), who live with HIV, that would be willing to participate in the research?" The following message was displayed: 'If so, could you please ask your friend for permission to share the preferred contact method (e-mail, telephone, or social network) so that I can present the survey?"

The inclusion criteria were: 1) being a cisgender man and having sex with men (MSM), regardless of whether they identify as gay, bisexual, or other (Boellstorff, 2011); 2) being over 18 years old; 3) having been diagnosed with HIV, whether or not they had progressed to AIDS[2]; 4) having been on ART for at least three months (criterion for the application of the adherence scale; Remor, 2002); and 5) having access to the internet and the ability to complete the assessment instruments in private. Transgender men were excluded from this study because new research will focus exclusively on this key population to understand the specificities of experiences related to sexual stigma, HIV-related stigma, psychopathologies, and their effects on ART adherence.

The researcher interviewed participants to ensure they met the inclusion criteria. All participants identified through the seed method met the criteria and agreed to complete the evaluation form. Data

[2] HIV infection and Acquired Immune Deficiency Syndrome (AIDS) are distinct conditions. Individuals living with HIV have been exposed to the virus through different modes of transmission. AIDS represents a late-stage clinical manifestation of HIV infection, characterized by a significant weakening of the immune system, particularly a reduction in T-CD4+ lymphocyte count. This immunodeficiency increases susceptibility to opportunistic infections and increases the risk of mortality (Pereira, 2018).

collection for the pilot study occurred over one month, with the saturation criterion based solely on this timeframe. No saturation criterion based on participant characteristics was adopted.

Measures

Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral en personas con VIH (CEAT-HIV)

The Questionnaire for the Assessment of Adherence to Antiretroviral Treatment (CEAT-HIV) is a questionnaire originally developed in Spanish to assess adherence to ART among adults living with HIV (Remor, 2002). In this study, we used the Portuguese version (Remor et al., 2007). It consists of 20 items that assess primary factors associated with ART adherence, including the frequency of medication intake, understanding of treatment and its effects, and the quality of the patient-healthcare team relationship. Example items include: "I have difficulties adhering to my medication schedule" and "I fully understand the effects of my treatment." Responses are rated on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*), with higher scores indicating greater adherence. Scores above 74 indicate adequate adherence, whereas scores of 74 or lower indicate inadequate adherence (Remor, 2002). The CEAT-HIV demonstrated good internal consistency (Cronbach's alpha = .71) and has shown adequate psychometric properties in the Brazilian context (Cronbach's alpha = .64, Remor et al., 2007). In the current study, the CEAT-HIV showed acceptable reliability, with a Cronbach's alpha of .74.

Internalized Homophobia Scale (IHS)

The IHS assesses internalized and external perceptions of stigma related to same-sex orientation. It consists of 20 items distributed across two dimensions: 1) Internal Perception of Stigma, reflecting internalized feelings of shame or self-devaluation; and 2) External Perception of Stigma, which evaluates fear of rejection and discrimination from others (Ross & Rosser, 1996). Examples of statements include: 1) "I feel ashamed of being gay," and 2) "Life would be easier if I were heterosexual." Responses are rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The total score ranges from 20 to 100, with higher scores indicating greater levels of internalized homonegativity. There is no established cutoff point for defining high or low levels of internalized homonegativity. In the present study, we used the 19-item Brazilian version of the IHS, which showed stronger internal validity in the validation study (Lira & Morais, 2019), with a Cronbach's alpha of .81 for the Internal Perception of Stigma and .62 for the External Perception of Stigma. Although the original instrument uses the expressions *homophobia* and *internalized homophobia*, we prefer the terms *homonegativity* and *internalized homonegativity*, as these are more comprehensive and comprise indirect and veiled forms of discrimination, as well as

microaggressions, against individuals with a same-sex orientation (Mayfield, 2001). The IHS demonstrated acceptable reliability in the current study, with a Cronbach's alpha of .77.

HIV Stigmatization Scale (HSS)

The HSS evaluates perceived societal views about people living with HIV. It comprised 40 items distributed across four subscales: 1) Personalized Stigma, which measures feelings of being personally devalued by others; 2) Disclosure Concerns, which assesses fears and worries about revealing one's HIV status; 3) Negative Self-Image, reflecting internalized feelings of shame and guilt; and 4) Public Attitudes (Berger et al., 2001). Examples of statements include: 1) "I feel set apart, isolated from others," 2) "I worry that others will reject me if they know my HIV status," 3) "I feel ashamed of my HIV status," and 4) "Most people with HIV are treated unfairly.". Each item is rated on a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*), with higher scores indicating greater stigma. The total score ranges from 40 to 160. The overall stigmatization index is calculated by averaging the responses, with no established cutoff for stigma levels. The HSS had shown strong internal consistency, with a Cronbach's alpha of .91; Berger et al., 2001), and its validity had been confirmed in the Brazilian population (Suit, 2005). The HSS demonstrated acceptable reliability in the present study, with a Cronbach's alpha of .89.

State-Trait Anxiety Inventory (STAI)

The STAI was designed to measure anxiety in two dimensions: 1) Trait Anxiety, which assesses an individual's general anxiety level over time, and 2) State Anxiety, which evaluates how the individual feels at the current moment (Spielberger et al., 1970). Both scales consist of 20 items related to anxiety symptoms. Example items include: 1) "I worry too much over something that really doesn't matter," and 2) "I feel nervous." Responses are rated on a four-point Likert scale (1 = *not at all* to 4 = *very much*), with higher scores indicating greater anxiety. The total scores range from 20 to 80 for both state and trait anxiety, with no specific cutoff for anxiety classification. In the validation study for the Brazilian population, the instrument demonstrated good reliability, with Cronbach's alphas ranging from .86 to .95 for State Anxiety and from .89 to .92 for Trait Anxiety (Biaggio et al., 1977). In the current study, the STAI showed acceptable reliability, with a Cronbach's alpha of .91.

Beck Depression Inventory (BDI-II)

The BDI-II evaluates depression symptoms and their severity through 21 items (Beck et al., 1961). Each item has four response options, ranging from 0 (e.g., "I do not feel sad") to 3 (e.g., "I am so sad or unhappy that I can't stand it"), reflecting increasing symptom severity. Examples of items include: "I have trouble sleeping" (physical symptom), and "I feel sad" (cognitive symptom). The total score ranges from 0 to 63, with the following depression categories: 0–11 = minimal, 12–19 = mild, 20–35 = moderate, and 36–63 = depression. In a validation study for the Brazilian population, the BDI-II

demonstrated good reliability, with a Cronbach's alpha of .81 (Gorenstein & Andrade, 1998). The BDI-II showed good internal consistency in this study, with a Cronbach's alpha of .80.

Sociodemographic and Clinical Questionnaire

The Sociodemographic and Clinical Questionnaire was developed by the first author to gather information on participants' sociodemographic and clinical characteristics. Sociodemographic variables included age, sex, marital status, education, occupation, and income. Clinical data collected included age at HIV diagnosis, age at ART initiation, current viral load, and ART type.

Statistical Analysis

Statistical analyses were performed using SPSS 20.0, with significance set at p <.05. Descriptive analyses were presented as frequencies, proportions, means, medians, and standard deviations.

The entire sample (n = 43) was included in the analyses. Participants were then categorized into two groups based on CEAT scores: adequate adherence (score > 74) and inadequate adherence (score ≤ 74) (Remor et al., 2007).

The total sample (n = 43) was considered for the analyses. Then, it was divided into an adequate adherence group (CEAT score greater than 74) and an inadequate adherence group (CEAT score less than or equal to 74) (Remor et al., 2007).

Data normality was assessed using the Shapiro–Wilk tests, and homogeneity of variance was assessed using Levene's test.

Given that the data distribution was normal, Pearson's correlation coefficient (r) was used to examine relationships between antiretroviral treatment adherence (CEAT-HIV), depression (BDI-II), anxiety state (STAI-State), anxiety trait (STAI-Trait), internalized homonegativity (IHS), and HIV-related stigma (HSS).

Parametric analyses were performed using independent t-tests, whereas non-parametric variables were analyzed using the Mann–Whitney test. Categorical variables were evaluated using the chi-square test.

A stepwise multiple linear regression analysis was conducted to assess the predictive power of depression (BDI-II), anxiety state (STAI-State), anxiety trait (STAI-Trait), internalized homonegativity (IHS), and HIV-related stigma (HSS) on ART adherence (CEAT-HIV). To ensure the appropriateness of the regression models, several assumptions were tested. The normality of residuals was verified using the Shapiro–Wilk test. Multicollinearity was assessed by examining the variance inflation factor (VIF), with values indicating no multicollinearity issues. Homoscedasticity was examined through residual plots to confirm equal variance across the data. Linearity was verified by inspecting the relationships between the predictor and dependent variables. Finally, the independence of errors was assessed using the Durbin-Watson statistic indicating no

autocorrelation. All assumptions were met, confirming the suitability of the data for linear regression analysis.

Effect sizes were reported as Cohen's *d* for *t*-tests, rank-biserial correlation for Mann–Whitney tests, and phi (φ) for chi-square tests. Effect sizes were interpreted as follows: $d = 0.20$ (small effect), $d = 0.50$ (medium effect), and $d = 0.80$ (large effect). Correlation strength was classified as 0–.30 (weak), .30–.70 (moderate), and .70–1 (strong) (Cohen, 1988).

Ethical Considerations

This research project was approved by the Research Ethics Committee of the School of Nursing, University of São Paulo (number: 4.601.952, CAAE: 31527820.7.0000.5392, dated March 19, 2021). All participants provided informed consent prior to participation in accordance with the ethical guidelines of the Declaration of Helsinki and relevant national regulations for research involving human subjects.

Results

Sociodemographic and Clinical Characteristics and Health Outcomes Among Brazilian MSM living with HIV

Forty-three Brazilian MSM living with HIV participated in the study. The mean age was 34.93 years ($SD = 7.90$). All participants reported having engaged exclusively in sexual activity with men over the past five years. Most were aged between 26 and 41 years, single, had completed undergraduate or postgraduate education, were employed, lived in rental housing, had an income between 1 and 4.9 times the minimum wage, and resided with family members or partners. Table 1 provides a detailed description of the sociodemographic characteristics of the participants.

More than half of the participants reported taking Dolutegravir, Lamivunide, and Tenofovir Disoproxil Fumarate daily as part of a two-pill regimen distributed free of charge by the Brazilian public health system. All patients indicated that their most recent viral load test at their treatment center showed undetectable results. A significant proportion of participants reported using alcohol or other substances, with many attributing this use to exacerbating problems in their lives.

Regarding physical health and quality of life, only a small number of participants reported deterioration following their HIV diagnosis, whereas a considerable number indicated a decline in mental health. Table 2 summarizes the clinical characteristics of the participants.

Table 1

Sociodemographic Description of the Participants (N = 43)

Variable	Category	*n* (%)
Age	18–25	3 (6.98%)
	26–33	17 (39.53%)
	34–41	14 (32.56%)
	Over 41	9 (20.93%)
Education	Elementary school	2 (4.65%)
	High school	13 (30.23%)
	Technical school	3 (6.98%)
	Undergraduate	11 (25.58%)
	Postgraduate	14 (32.55%)
Marital Status	Single	35 (81.40%)
	Married/In a stable relationship	7 (16.28%)
	Divorced	1 (2.32%)
	Widower	0 (0%)
Employment Status	Employed	32 (74.42%)
	Unemployed	7 (16.28%)
	On leave for health reasons	3 (6.98%)
	Retired	1 (2.32%)
Income (minimum wage) [1,2]	1–2.9 minimum wages	16 (50%)
	3–4.9 minimum wages	4 (12.5%)
	5 or more minimum wages	12 (37.5%)
Housing Status	Own	19 (44.2%)
	Rented	21 (48.8%)
	Borrowed/loaned	3 (7%)
Current Living Situation	Alone	16 (37.2%)
	With family or partner	23 (53.5%)
	With colleagues/friends	4 (9.3%)

Note.
[1] Calculations were based on the 32 (74.5%) employed participants.
[2] The Brazilian minimum wage in 2021 was R$ 1.100.00 (approximately €210,00).

Table 2

Clinical Characteristics of the Participants (N = 43)

Variable	Category	*n* (%)
Age of HIV diagnosis	18–25	20 (46.51%)
	26–33	15 (34.89%)
	Over 33	8 (18.60%)
Age of ART initiation	18–25	18 (41.86%)
	26–33	16 (37.20%)
	Over 33	9 (20.94%)
Antiretroviral Medication [1]	Dolutegravir/Tenofovir/Lamivudine	28 (70.0%)
	Other	12 (30.0%)
Viral Load Status	Detectable	0 (0%)
	Undetectable	43 (100%)
Substance Use (Alcohol, Tobacco, or Drugs)	Yes	29 (67.4%)
	No	14 (32.6%)
Problematic Substance Use [2]	Yes	27 (62.8%)
	No	16 (37.2%)
Physical Health Since HIV Diagnosis	Worsened	8 (18.6%)
	Remained stable or improved	35 (84.4%)
Quality of Life Since HIV Diagnosis	Worsened	4 (9.3%)
	Remained stable or improved	39 (90.7%)
Mental Health Since HIV Diagnosis	Worsened	16 (37.2%)
	Remained stable or improved	27 (62.8%)

Note.
[1] Calculations were performed for 40 (93%) participants. Three participants (7%) either did not know or did not respond.
[2] One participant considered their alcohol, tobacco, or substance use to have caused or worsened existing problems.

ART Adherence and Depression, Anxiety, Homonegativity, and HIV-Related Stigma

Regarding adherence to ART, 12 (27.90%) participants showed inadequate adherence (CEAT-HIV score ≤ 74), and 31 (73.10%) participants showed adequate adherence. The mean adherence score was 78.77 (*SD* = 6.26), ranging from 65 to 89 (strict adherence).

Depression was present in 18 (41.8%) participants, with ten (23.2%) showing mild depression, six (14.0%) with moderate depression, and 2 (4.7%) experiencing severe depression. The mean depression score (BDI-II) was 9.91 (*SD* = 8.26), ranging from zero to 34. A total of 25 participants (58.1%) showed no clinical signs or symptoms of depression.

The mean State Anxiety score (STAI-State) was 44.72 (*SD* = 5.17), ranging from 34 to 58, and the mean Trait Anxiety score (STAI-Trait) was 44.00 (*SD* = 6.49), with scores ranging from 32 to 61.

Table 3 presents descriptive statistics for the IHS and HSS scales and their subscales.

Table 3

Descriptive Statistics for Internalized Homonegativity and HIV-Related Stigma with Subscale Scores (N = 43)

Variable	*M*	*SD*	Min	Max
Internalized Homonegativity (IHS)	49.01	3.71	39.00	60.00
Internal Perception of Stigma	38.16	3.43	30.00	47.00
External Perception of Stigma	11.22	1.34	9.00	15.00
HIV Stigmatization (HSS)	97.65	17.02	62.00	141.00
Personalized Stigma	38.81	11.01	21.00	65.00
Disclosure Concerns	31.44	5.15	17.00	40.00
Negative Self-Image	28.35	7.50	15.00	44.00
Public Attitudes	50.07	8.88	33.00	70.00

Note. IHS = Internalized Homonegativity Scale; HSS = HIV Stigmatization Scale.

Correlations Between Adherence, Psychopathology, and Stigma

Table 4 presents the correlations among the study variables. A moderate negative correlation was observed between CEAT-HIV and BDI-II, indicating that higher levels of adherence were associated with lower levels of depression. CEAT-HIV was not significantly correlated with other variables.
In the stepwise regression analysis, BDI-II significant predictor of CEAT-HIV

Table 4

Correlation Between Treatment Adherence, Psychopathology, and Stigma (N = 43)

Variable	1	2	3	4	5	6
1. ART Adherence (CEAT-HIV)	—					
2. Depression (BDI-II)	-.39**	—				
3. Anxiety State (STAI-State)	.06	.14	—			
4. Anxiety trait (STAI-Trait)	-.16	.64***	.48***	—		
5. Homonegativity (IHS)	.07	.21	-.09	.13	—	
6. HIV-Related Stigma (HSS)	-.13	.46**	.05	.45**	.43**	—

Note. CEAT-HIV = Questionnaire for the Assessment of Adherence to Antiretroviral Treatment; BDI-II = Beck Depression Inventory-II; STAI = State-Trait Anxiety Inventory; IHS = Internalized Homonegativity Scale; HSS = HIV Stigmatization Scale.
*$p < .05$; **$p < .01$; ***$p < .001$.

Group Comparisons of Depression, Anxiety, Homonegativity, and HIV-Related Stigma by ART Adherence

Group comparisons were conducted between participants with adequate adherence (n = 31) and inadequate adherence (n = 12) to ART (CEAT-HIV). The analyses revealed significant differences in depression scores between the groups, with higher depression levels observed in participants with inadequate adherence. This difference had a small effect size. No statistically significant differences were found between the groups for anxiety (STAI-State and STAI-Trait), homonegativity (IHS), or HIV-related stigma (HSS) scores, as summarized in Table 5.

In addition to these findings, educational level was significantly higher in the adequate adherence group (67.7% vs. 33.3%; p = .048, d = -0.31). Participants in the adequate adherence group were also more likely to report stable or improved physical health following HIV diagnosis (90.3% vs. 58.3%, p = .016, d = -0.37). Problems caused or aggravated by substance use were reported for a higher percentage of participants with inadequate adherence (83.3% vs. 54.8%, p = .046, d = -0.28). No statistically significant differences were found for other sociodemographic or clinical variables.

Discussion

This study aimed to evaluate ART adherence and its associations with homonegativity, HIV-related stigma, depression, and anxiety among Brazilian MSM living with HIV. The results revealed important insights into adherence patterns within this population.

Approximately one in four participants showed inadequate adherence, a finding consistent with Brazilian studies. For instance, Foresto et al. (2017) reported irregular adherence in 25% of participants, while a systematic review of 11 Brazilian studies found that 20% to 40% of individuals exhibited insufficient adherence, regardless of the assessment method used (Garbin et al., 2017). Notably, unlike these studies, which examined the general HIV-positive population, the present research focused exclusively on MSM living with HIV, a demographic uniquely affected by HIV-related stigma and homonegativity.

These findings highlight the broader challenges of ART adherence in people living with HIV. HIV infection is currently considered a chronic disease, presenting ongoing challenges for maintaining lifelong adherence to ART. Irregular adherence is a leading cause of HIV treatment failure.

Table 5

Comparison of Depression, Anxiety, Homonegativity, and HIV-Related Stigma Scores by ART Adherence Status (N = 43)

Variable	Adherence [1]	*Md*	Min	Max	*p* [2]	Cohen's *d*
Depression (BDI-II)	Inadequate	14.50	2.00	34.00	.048	-0.19
	Adequate	8.00	0.00	28.00		
Anxiety State (STAI-State)	Inadequate	44.00	37.00	58.00	0.621	—
	Adequate	46.00	34.00	53.00		
Anxiety trait (STAI-Trait)	Inadequate	44.00	32.00	61.00	0.233	—
	Adequate	43.00	32.00	59.00		
Homonegativity (IHS)	Inadequate	48.00	39.00	57.00	.621	—
	Adequate	48.00	43.00	60.00		
Internal Perception of Stigma	Inadequate	38.00	30.00	46.00	.233	—
	Adequate	37.00	32.00	47.00		
External Perception of Stigma	Inadequate	10.50	9.00	12.00	0.249	—
	Adequate	11.00	9.00	15.00		
HIV-Related Stigma (HSS)	Inadequate	99.50	62.00	141.00	.967	—
	Adequate	96.00	65.00	130.00		
Personalized Stigma	Inadequate	43.00	21.00	64.00	.217	—
	Adequate	37.00	22.00	65.00		
Disclosure Concerns	Inadequate	30.00	17.00	35.00	.162	—
	Adequate	31.00	23.00	40.00		
Negative Self-Image	Inadequate	30.00	15.00	44.00	.464	—
	Adequate	27.00	16.00	42.00		
Public Attitudes	Inadequate	52.50	33.00	70.00	.297	—
	Adequate	48.00	35.00	69.00		

Note. BDI-II = Beck Depression Inventory-II; STAI = State-Trait Anxiety Inventory; IHS = Internalized Homonegativity Scale; HSS = HIV Stigmatization Scale.

[1] Adherence groups were based on the Questionnaire for the Assessment of Adherence to Antiretroviral Treatment, with inadequate adherence defined as CEAT-HIV score ≤ 74 and adequate adherence as CEAT-HIV score > 74.

[2] Mann–Whitney test.

[*] $p < .05$.

Despite nearly 40 years of progress since the onset of the HIV epidemic, ART has become more effective, with reduced toxicity, fewer side effects, and simpler dosing regimens. Nevertheless, treatment adherence remains a persistent challenge. Non-adherence can result in treatment failure, necessitating medication changes or additional therapies. Furthermore, inconsistent adherence can increase viral load, which elevates chronic inflammation, cardiovascular risk, and the likelihood of

HIV transmission, affecting both individual and public health (UNP Brasil, 2018). ART adherence is also a key component of United Nations Program's Combined Prevention strategy, adopted by several countries, including Brazil (UNP Brasil, 2022; UNP Brasil, 2016).

In addition to adherence challenges, our study found that nearly half of the participants experienced some level of depression. This aligns with existing research, which shows that the prevalence of depression among MSM is higher than in the general population (Lee et al., 2017), with HIV-positive MSM facing an even greater risk (Bromberg et al., 2020). A recent meta-analysis of 18 studies involving MSM with (n = 7,653) and without HIV (n = 3,395) found a 43% prevalence of depression among HIV-positive MSM and a higher likelihood of depression compared to MSM without HIV (OR = 1.46, 95% CI = 1.05–2.03) (Xiao et al., 2020). This result is consistent with our study's findings, where 41.8% of participants exhibited symptoms of depression. The high prevalence of depression observed in our sample supports the Minority Stress Theory (Frost & Meyer, 2023; Meyer, 2003), which posits that minority groups, such as MSM, face compounded stressors. These include the stressors of daily life as well as those related to social marginalization, such as bullying, rejection, isolation, physical or verbal violence, and microaggressions. Moreover, repeated exposure to homophobic messages may lead to internalized homonegativity, further affecting mental health (Xiao et al., 2020; Bromberg et al., 2020; Lee et al., 2017). Studies confirm that individuals with minority characteristics, such as MSM living with HIV, are more prone to negative mental health outcomes (Meyer, 2003).

Despite the high depression scores, and contrary to our initial hypotheses, no association was found between trait or state anxiety and treatment adherence. However, higher trait anxiety scores were associated with higher levels of serological stigma. Additionally, the results indicated that higher depression scores were linked to lower adherence to ART and higher serological stigma scores. When comparing the adequate and inadequate adherence groups, significant differences were observed in depression scores, with the inadequate adherence group showing higher scores. These results align with both national (Carvalho et al., 2019) and international studies (Quinn & Voisin, 2020). Depression is known to impair self-care behaviors and diminish the desire to live (Bromberg et al., 2020; Garbin et al., 2017), which likely explains the compromised adherence to antiretroviral medication, particularly in moderate to severe cases of depression.

In our study, internalized homonegativity was not associated with negative mental health outcomes but was related to HIV-related stigma. The pernicious effect of this interface between different stigmas in key seropositive populations has been well-documented in the literature (Alckmin-Carvalho et al., 2024; Costa et al., 2021). However, neither HIV-related stigma nor homonegativity was associated with treatment adherence, contradicting our initial hypothesis. Although the impact of prejudice toward sexual diversity and violence on treatment adherence has been described in the literature (Ortiz-Hernández et al., 2021a, 2021b), this was not observed in the present case. Given the small size, we can assume that our sample group lacked sufficient diversity in experiences of

extreme prejudice, which could have been more apparent in a larger sample. Alternatively, we can conjecture that there may be a mediating effect between experiences of prejudice and mental health, wherein worsened mental health affects adherence, as suggested by our correlation results. In this scenario, there may be no direct relationship between prejudice and adherence; instead, low adherence would occur when prejudice leads to poorer mental health.

Limitations

Despite its contributions, this study is not without limitations. First, the small sample size limits the generalizability of the findings and may have reduced the diversity of experiences related to stigma and prejudice faced by Brazilian MSM living with HIV. Second, the use of self-report instruments to measure adherence and mental health variables introduces the possibility of bias, particularly social desirability, which may have led to overestimated adherence. Additionally, participants' self-perception may have resulted in the underreporting of homonegativity, HIV-related stigma, depression, and anxiety. Our study also did not evaluate other important psychosocial factors that could influence ART adherence, such as skin color, socioeconomic status, exposure to violence, and trauma. These variables are important for understanding the broader context of adherence challenges in this population. Future studies should address these limitations by including larger and more diverse samples and incorporating these additional variables to provide a more comprehensive understanding of the factors affecting ART adherence among Brazilian MSM living with HIV.

Conclusion

This study contributes to the limited body of research on the relationship between HIV-related stigma, psychopathology, and ART adherence among Brazilian MSM living with HIV. Despite the long-standing stigma associated with HIV and sexual minorities, our findings suggest that depression is a critical factor influencing adherence, underscoring the need for regular mental health screenings in HIV care settings. The absence of associations between homonegativity, HIV-related stigma, and adherence suggests that these variables may indirectly influence adherence through their effects on mental health, warranting further investigation. Mental health professionals working with MSM living with HIV should explore patients' relationships with health teams, pharmacological treatments, and experiences of stigma. Psychotherapy, in particular, can play a key role in addressing internalized prejudice and promoting adherence. Future studies with larger and more diverse samples are necessary to deepen our understanding of the complex social and psychological factors that impact ART adherence in this population.

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