

## ORIGINAL ARTICLE

# Depressive symptoms and adherence to antiretroviral treatment among people with HIV attending a Peruvian public hospital

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### Keywords:

depression; HIV; treatment adherence; antiretroviral therapy; mental health I (source: MeSH-NLM).

## ABSTRACT

**Objective.** To explore the relationship between depressive symptoms and treatment adherence among people with human immunodeficiency virus (HIV) attending a public hospital in Lima, Peru. **Methods.** A cross-sectional correlational study was conducted. A total of 300 adults diagnosed with HIV participated in the study. Depression was assessed using the Beck Depression Inventory-II (BDI-II), and treatment adherence was assessed using the Questionnaire for the Evaluation of Adherence to Antiretroviral Treatment (CEAT-VIH, by its Spanish acronym). The analysis included descriptive statistics and adjusted multivariate logistic regression analysis. **Results.** A high prevalence of depressive symptoms was observed, as well as a considerable proportion of participants with inadequate adherence to antiretroviral treatment. No statistically significant differences in treatment adherence were found between participants with moderate and severe depression compared with those with mild depression in the multivariate logistic regression analysis adjusted for age and sex. **Conclusions.** Although depression was not an independent predictor of adherence, its high frequency highlights the importance of integrating mental health assessment and management into the comprehensive care of people living with HIV.

# Síntomas depresivos y adherencia al tratamiento antirretroviral en personas con VIH atendidas en un hospital público peruano

### Palabras clave:

depresión; VIH; adherencia al tratamiento; terapia antirretroviral; salud mental (fuente: DeCS-BIREME).

## RESUMEN

**Objetivo.** Explorar la relación entre los síntomas depresivos y la adherencia al tratamiento en personas con el virus de inmunodeficiencia humana (VIH) atendidas en un hospital público de Lima, Perú. **Métodos.** Se realizó un estudio transversal y correlacional. Participaron 300 personas adultas con diagnóstico de VIH. La depresión fue evaluada mediante el Inventario de Depresión de Beck-II (BDI-II) y la adherencia al tratamiento mediante el Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral (CEAT-VIH). El análisis incluyó estadística descriptiva y un análisis de regresión logística multivariado ajustado. **Resultados.** Se evidenció una alta presencia de síntomas depresivos y una proporción considerable de participantes con adherencia no adecuada al tratamiento antirretroviral. No se evidenciaron diferencias estadísticamente significativas en la adherencia al tratamiento entre los niveles moderados y severos de depresión en comparación con aquellos con depresión leve en el análisis de regresión logística multivariado, ajustado por edad y sexo. **Conclusiones.** Aunque la depresión no se comportó como un predictor independiente de la adherencia, su elevada frecuencia resalta la importancia de integrar la evaluación y el abordaje de la salud mental en la atención integral de las personas que viven con VIH.

**Cite as:** Hernández-Aparcana JY, Buendia-Huamani LF. Depressive symptoms and adherence to antiretroviral treatment among people with HIV attending a Peruvian public hospital. Rev Perú Cienc Salud. Rev Peru Cienc Salud. 2026;8(1):32-9. doi: <https://doi.org/10.37711/rpcs.2026.8.1.9>

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## INTRODUCTION

Mental health is a fundamental component of human well-being, particularly among people living with chronic conditions such as human immunodeficiency virus (HIV) infection <sup>(1)</sup>. Despite advances in antiretroviral therapy (ART), which have enabled people living with HIV (PLHIV) to achieve a life expectancy similar to that of the general population, effective management of this condition largely depends on sustained adherence to the therapeutic regimen <sup>(2)</sup>. However, various biological, social, and psychological factors continue to negatively affect the quality of life of this population <sup>(3)</sup>. Among these, depression is recognized as one of the most frequent and clinically relevant comorbidities because of its direct impact on clinical prognosis, emotional regulation, and patients' treatment-related behavior <sup>(4,5)</sup>.

It is estimated that more than 39 million people are living with HIV worldwide, and between 30% and 40% experience depressive symptoms during the course of the disease <sup>(6,7)</sup>. This mood disorder, characterized by persistent sadness, anhedonia, and functional impairment, has been documented as a significant risk factor for non-adherence to antiretroviral treatment <sup>(8,9)</sup>. International studies have shown that patients with HIV who experience depression are between 42% and 72% more likely to fail to adhere to their treatment regimen <sup>(4)</sup>, and this situation is exacerbated in settings characterized by poverty, inequality, stigma, and limited access to mental health services <sup>(10,11)</sup>.

From an empirical perspective, the current body of evidence shows heterogeneous findings regarding the association between depressive symptoms and adherence to antiretroviral treatment among people living with HIV. Several correlational studies and systematic reviews have reported that depression is significantly associated with poorer treatment adherence because of its effects on motivation, personal organization, and continuity of treatment <sup>(4,7)</sup>. However, other recent studies have suggested that this relationship is not always direct and may instead be mediated by psychosocial factors such as social support, HIV-related stigma, and patient self-efficacy <sup>(8-10)</sup>.

In this regard, current scientific evidence suggests that treatment adherence among people with HIV is a multifactorial phenomenon whose behavior varies according to the clinical and social context,

highlighting the need to continue exploring this relationship in specific settings through correlational studies.

In Latin America, and particularly in Peru, the relationship between depression and treatment adherence has also been documented as a relevant concern. According to the Ministry of Health <sup>(12)</sup>, more than 96,000 people have been diagnosed with HIV in the country. Although ART coverage has increased, adherence levels remain suboptimal, particularly in areas where mental health resources are limited. In addition, it has been reported that 48% of PLHIV in Lima had moderate to severe depressive symptoms and that these symptoms were significantly associated with treatment interruption <sup>(13)</sup>. Likewise, in Arequipa, depression was reported as a key predictor of treatment discontinuation, particularly among women experiencing unfavorable socioeconomic conditions <sup>(14)</sup>.

Therefore, adherence to antiretroviral treatment represents one of the main challenges in the comprehensive management of HIV, because therapeutic success largely depends on continuity and adequate compliance with the prescribed pharmacological regimen <sup>(2)</sup>. Insufficient adherence may lead to treatment failure, increased viral load, disease progression, development of antiretroviral resistance, and an increased risk of HIV transmission <sup>(3-6)</sup>. Despite advances in access to treatment, several studies have reported that a considerable proportion of people living with HIV experience difficulties in maintaining sustained adherence over time <sup>(8-10)</sup>.

Currently, adherence is understood as a multifactorial and dynamic phenomenon influenced by psychological, social, economic, and health service-related variables. Factors such as depression, HIV-related stigma, limited social support, low self-efficacy, and difficulties in accessing healthcare have been identified as factors that may negatively affect treatment adherence <sup>(7-10)</sup>. In this context, understanding the challenges associated with adherence is essential for developing comprehensive strategies aimed at improving clinical outcomes and quality of life in this population.

From a theoretical perspective, this study seeks to provide empirical evidence from an underrepresented setting, namely a public hospital in Metropolitan Lima, and to contribute to the body of knowledge in clinical psychology and public health. From a practical perspective, the findings are expected to inform the

design of intervention strategies that integrate mental health into the comprehensive care of people living with HIV. Unlike previous studies, this study used instruments validated in Latin American populations and focused on an urban and semi-urban sample, thereby strengthening the contextual applicability and social relevance of the findings. Thus, the study aims to contribute to a better understanding of the relationship between mental health and adherence, with the ultimate goal of improving clinical outcomes and the emotional well-being of people living with HIV.

Accordingly, the objective of this study was to explore the relationship between depressive symptoms and treatment adherence among people with HIV attending a public hospital in Metropolitan Lima. Depression was understood as an affective disorder characterized by symptoms such as persistent sadness, loss of interest, sleep disturbances, and low self-esteem <sup>(5)</sup>, whereas treatment adherence was defined as the extent to which patients' behavior conforms to prescribed medical recommendations <sup>(2)</sup>.

## METHODS

### Study design

This study used an observational, cross-sectional, correlational design, as it sought to analyze the relationship between depression levels and adherence to antiretroviral therapy (ART) among people diagnosed with HIV <sup>(15)</sup>. This type of design allows relationships between variables to be assessed at a specific point in time and is widely used in observational research aimed at analyzing associated factors <sup>(16)</sup>. The study was conducted during 2025 at a public hospital in Metropolitan Lima.

### Population and sample

The population consisted of 300 adults (190 men and 110 women) with a confirmed diagnosis of HIV infection. A census approach was used because all eligible individuals were included. Therefore, no sample size calculation was performed.

### Variables and data collection instruments

Depression was assessed using the Beck Depression Inventory-II (BDI-II), developed by Beck et al. (1996) <sup>(17)</sup> and adapted and validated in Latin American populations <sup>(18)</sup>. This instrument consists of 21 items that assess affective, cognitive, and somatic symptoms of depression using a 0-to-3 Likert-type

scale. The reliability reported in the Peruvian context is adequate ( $\alpha = 0.89$ ) <sup>(19,20)</sup>.

For interpretation of the results, BDI-II scores were categorized into mild depression (0–13 points), moderate depression (14–28 points), and severe depression (29–63 points), following the criteria established in the original instrument manual and validation studies conducted in Latin American populations <sup>(17,18)</sup>.

Likewise, adherence to antiretroviral treatment was assessed using the Questionnaire for the Evaluation of Adherence to Antiretroviral Treatment (CEAT-VIH, by its Spanish acronym), developed by Remor <sup>(21)</sup>, which assesses behaviors and attitudes related to treatment adherence among people living with HIV. The instrument consists of 20 items with Likert-type response options and allows classification of the overall level of treatment adherence.

Several studies conducted in Latin American populations have reported adequate psychometric properties of the CEAT-VIH, demonstrating satisfactory levels of validity and reliability for its use in HIV-related clinical settings <sup>(21,22)</sup>. Similarly, studies conducted in Spanish-speaking populations have reported internal consistency coefficients above 0.80, supporting its stability and precision in measuring treatment adherence <sup>(23)</sup>.

### Data collection techniques and procedures

The corresponding ethical and administrative authorizations were obtained from the management of the healthcare facility. Subsequently, patients were invited to participate during their medical appointments, and the objectives and conditions of the study were explained. Those who agreed to participate signed the informed consent form. The instruments were administered individually in private settings, with an approximate duration of 25 minutes per participant.

### Data analysis

A multivariable binary logistic regression analysis was performed to assess the association between depressive symptoms and treatment adherence. For this analysis, the adherence variable was dichotomized into adequate and inadequate adherence. Depression was entered into the model according to its categorical levels (mild, moderate, and severe), with mild depression used as the reference category. A multivariable analysis was subsequently performed using binary logistic regression adjusted for age and sex.

The regression model included depression level, sex, and age as independent variables to explore their potential contribution to the probability of adequate treatment adherence. Results were expressed as odds ratios (ORs) with their corresponding 95% confidence intervals.

Before performing the multivariable regression model, which included adjustment variables such as age and sex, the corresponding statistical assumptions were assessed, including independence of observations, absence of multicollinearity among the independent variables, and linearity in the logit for the continuous variable included in the model<sup>(16)</sup>. These criteria ensured the appropriateness of the statistical analysis for evaluating factors associated with treatment adherence.

A statistical significance level of  $p < 0.05$  was adopted for all analyses. The results were interpreted considering the characteristics of the cross-sectional design and the inherent limitations of the study.

### Ethical considerations

Ethical considerations were based on the Belmont Report, with respect for the principles governing research involving human participants<sup>(13)</sup>. This study was approved by the Biomedical Research Ethics Committee of Hospital Nacional Dos de Mayo (CIEI-HNDM), according to Record/File No. 050-2023-CIEI-HNDM.

Informed consent was obtained from all participants before data collection, ensuring that they were fully informed about the purpose of the study and the intended use of the information. The importance of data confidentiality and anonymity was also emphasized in order to protect the privacy of the individuals involved<sup>(14)</sup>. In addition, scientific integrity and transparency in the reporting of results

**Table 1.** Characteristics of the study population

| Variable | Category    | n   | %    |
|----------|-------------|-----|------|
| Sex      | Male        | 190 | 63.3 |
|          | Female      | 110 | 36.7 |
| Age      | 18–24 years | 44  | 15.0 |
|          | 25–35 years | 131 | 44.0 |
|          | 36–45 years | 67  | 22.0 |
|          | 46–55 years | 36  | 12.0 |
|          | 56–64 years | 17  | 6.0  |
|          | ≥ 65 years  | 5   | 2.0  |

**Table 2.** Levels of depressive symptoms among participants

| Variable         | Category | n   | %    |
|------------------|----------|-----|------|
| Depression level | Mild     | 41  | 13.7 |
|                  | Moderate | 226 | 75.3 |
|                  | Severe   | 33  | 11.0 |

were ensured, thereby avoiding manipulation or misrepresentation of data to support particular interests<sup>(15)</sup>.

Likewise, data confidentiality, participant anonymity, and respect for the ethical principles of research involving human subjects were ensured in accordance with the Declaration of Helsinki<sup>(24)</sup>.

## RESULTS

Table 1 presents the characteristics of the participants included in the study. The sample consisted predominantly of men (63.3%), which is consistent with the epidemiological distribution of HIV in urban settings in Peru. Regarding age, the 25–35-year age group predominated (44.0%), followed by the 36–45-year age group (22.0%), indicating that the study population consisted mainly of young and middle-aged adults.

Table 2 shows the distribution of depressive symptom severity levels among the participants. The largest proportion corresponded to the moderate level (75.3%), followed by mild (13.7%) and severe (11.0%) levels. These findings indicate that depressive symptoms were frequent among people living with HIV, with moderate symptoms being the most prevalent.

Table 3 presents the distribution of adherence to antiretroviral treatment among the participants. Most of the sample showed inadequate adherence (88.7%), whereas only 11.3% showed adequate adherence. This finding highlights substantial difficulties in treatment adherence, which could compromise therapeutic effectiveness and clinical outcomes among people living with HIV.

**Table 3.** Level of adherence to antiretroviral treatment

| Variable            | Category   | n   | %    |
|---------------------|------------|-----|------|
| Treatment adherence | Inadequate | 266 | 88.7 |
|                     | Adequate   | 34  | 11.3 |

**Table 4.** Relationship between depression level and adherence to antiretroviral treatment among people with HIV

| Variable         | Crude OR  | 95 % CI   | p value | Adjusted OR | 95 % CI   | p value |
|------------------|-----------|-----------|---------|-------------|-----------|---------|
| Depression level |           |           |         |             |           |         |
| Mild             | Reference |           |         | Reference   |           |         |
| Moderate         | 0.96      | 0.41-2.08 | 0.91    | 0.94        | 0.43-2.06 | 0.88    |
| Severe           | 0.83      | 0.31-2.18 | 0.7     | 0.81        | 0.30-2.20 | 0.68    |
| Sex              |           |           |         |             |           |         |
| Male             | Reference |           |         | Reference   |           |         |
| Female           | 0.77      | 0.37-1.61 | 0.48    | 0.8         | 0.38-1.69 | 0.56    |
| Age (continuous) | 1.02      | 1.00-1.05 | 0.11    | 1.01        | 0.99-1.04 | 0.17    |

Binary logistic regression analysis was performed to evaluate the relationship between depression levels and adherence to antiretroviral treatment, using mild depression as the reference category. A multivariable logistic regression analysis adjusted for age and sex was also performed. The results showed no statistically significant differences between participants with moderate or severe depression and those with mild depression in either the crude or adjusted analyses (Table 4).

Accordingly, neither moderate nor severe depression was significantly associated with treatment adherence compared with mild depression, in either the crude or the multivariable logistic regression analysis adjusted for age and sex.

DISCUSSION

The findings of this study show that depressive symptoms are frequent among people living with HIV who receive care at a public hospital in Metropolitan Lima. However, the multivariable logistic regression analysis showed no statistically significant differences in treatment adherence among participants with moderate or severe depression compared with those with mild depression. Although the *odds ratios* showed a slight trend toward lower adherence at higher levels of depression, the confidence intervals included the null value and the associations did not reach statistical significance. These findings suggest that, within the multivariable logistic regression model analyzed, depression was not independently associated with treatment adherence.

Regarding the frequency of depressive symptoms, the results are consistent with recent literature

identifying depression as one of the most common psychiatric comorbidities among people living with HIV. Several systematic reviews and meta-analyses have reported that the burden of depression in this population remains high across different healthcare settings, both in high-income countries and in settings with greater structural limitations <sup>(1,4,7)</sup>. Similarly, studies conducted in Latin America indicate that depressive symptoms continue to represent a relevant concern in the comprehensive care of people with HIV because of their impact on quality of life, emotional well-being, and continuity of healthcare <sup>(13)</sup>.

Nevertheless, the main finding of the study is that depression did not behave as an independent predictor of adherence to antiretroviral treatment. This result differs from part of the previous evidence describing significant associations between depressive symptoms and poorer treatment adherence. Some recent studies suggest that depression may reduce motivation, interfere with daily organization, and affect treatment continuity, thereby contributing to non-adherence <sup>(10,11,26)</sup>. Likewise, studies conducted in contemporary cohorts have shown that patients with depressive symptoms are more likely to be non-adherent to treatment, leading depression to be considered an important clinical factor in HIV management <sup>(10,26)</sup>.

From a clinical and behavioral perspective, this effect may be explained by the fact that depression is commonly associated with symptoms such as apathy, hopelessness, emotional fatigue, impaired concentration, and reduced self-efficacy, all of which may hinder consistent adherence to long-term therapeutic regimens. Similarly, depressive symptoms may contribute to social isolation, disruption of

daily routines, and the progressive abandonment of self-care behaviors, thereby indirectly affecting adherence to antiretroviral treatment. These interpretations are consistent with the cognitive-behavioral model of adherence, which proposes that treatment-related behaviors depend on motivational, emotional, and self-regulatory processes that may be altered by persistent affective disorders.

However, the results of this study are also supported by research indicating that the relationship between mental health and treatment adherence is neither linear nor uniform. Current scientific evidence suggests that treatment adherence among people living with HIV depends on multiple factors, including social support, HIV-related stigma, self-efficacy, relationships with healthcare services, coping strategies, and socioeconomic conditions <sup>(25,26)</sup>. In other words, depression may be part of the problem, but it does not necessarily explain it in isolation. This may help explain why, in some settings, the association between depression and adherence is more evident, whereas in others it becomes weaker after additional variables are incorporated into multivariable analyses.

From a methodological perspective, the absence of a statistically significant association does not necessarily imply that no relationship exists between depression and treatment adherence. An *odds ratio* close to 1 and a relatively narrow confidence interval suggest a small effect within the model analyzed; however, this statistical pattern may also be influenced by variability within the sample. Factors such as social support, HIV-related stigma, the therapeutic relationship, and socioeconomic conditions may act as mediating or moderating variables, reducing the direct effect of depression on treatment adherence.

These findings may be interpreted within the biopsychosocial model, which proposes that treatment adherence is not an exclusively individual behavior but rather the result of interactions among biological, psychological, and social factors <sup>(27)</sup>. In the context of HIV, this approach proposes that variables such as psychosocial support, emotional regulation, self-efficacy, support networks, and contextual conditions jointly influence adherence and retention in care. From this perspective, the absence of a significant association between depression and adherence does not diminish the clinical importance of depression, but rather suggests that its effect may be mediated or moderated by other dimensions that were not directly assessed in the model analyzed <sup>(28)</sup>.

In addition, the psychosocial determinants of health framework also provides a basis for interpreting the findings. This approach holds that health-related behaviors are shaped by structural and contextual factors that extend beyond individual characteristics. Recent literature also shows that variables such as HIV-related stigma, availability of social support, barriers to access, stability of the therapeutic relationship, and coping strategies may be as relevant as affective symptoms in explaining treatment adherence <sup>(8,25,26)</sup>. Therefore, it is reasonable to consider that, in this hospital-based sample, adherence may be more strongly influenced by contextual or relational factors than by depression level itself. This interpretation is particularly relevant in clinical settings where patients receive relatively stable follow-up but continue to face persistent social challenges.

Likewise, the lack of a significant association between sex and age and treatment adherence reinforces the idea that sociodemographic factors alone are insufficient to explain such a complex phenomenon. Rather than depending on isolated variables, adherence appears to reflect configurations of vulnerability and protection that combine individual, social, and institutional conditions <sup>(29)</sup>. In this regard, the value of this study lies in demonstrating that treatment-related behavior among people with HIV should be interpreted from a multifactorial and comprehensive perspective.

From a clinical perspective, these findings do not justify minimizing the importance of depression in the care of people living with HIV. On the contrary, the high frequency of depressive symptoms observed indicates that mental health remains a diagnostic and therapeutic priority. Recent evidence on the integration of mental health and HIV services in low- and middle-income countries shows that such interventions consistently improve mental health symptoms and, in several studies, also improve HIV-related outcomes, including treatment adherence <sup>(10,11)</sup>. This supports the need to strengthen integrated models of care, particularly in Latin American settings where fragmentation of services remains an important limitation.

Finally, future research should incorporate longitudinal designs and additional variables, such as social support and HIV-related stigma, in order to deepen the understanding of factors influencing treatment adherence. It is also important to strengthen the integration of mental health assessment into care programs for people living with HIV.

## Conclusions

This study shows a high prevalence of depressive symptoms and difficulties with adherence to antiretroviral treatment among people living with HIV who receive care at a public hospital in Metropolitan Lima. However, the multivariable logistic regression analysis did not identify statistically significant differences in treatment adherence across the different levels of depression.

These findings provide relevant evidence for the Peruvian clinical context by challenging the assumption of a direct and uniform relationship between depression and treatment adherence and highlighting the need to consider other psychosocial and contextual factors in the comprehensive care of people living with HIV.

## Acknowledgments

The authors thank the staff of the healthcare facility for facilitating the implementation of the study, as well as the participants for their collaboration during the data collection process.



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#### Authorship contribution

**JYH-A:** conceptualization, writing, original draft preparation, methodology, results analysis, discussion, supervision, review, and final editing of the manuscript.

**LFB-H:** conceptualization, writing, original draft preparation, methodology, results analysis, discussion, supervision, review, and final editing of the manuscript.

#### Funding sources

Self-funded.

#### Conflict of interest statement

The authors declare that they have no conflicts of interest.