

Characteristics of people hospitalized for HIV: multivariate cluster analysis of antiretroviral therapy interruption

Características de pessoas hospitalizadas por HIV: análise multivariada por cluster da interrupção da terapia antirretroviral

Características de personas hospitalizadas por VIH: análisis multivariado de conglomerados sobre la interrupción de la terapia antirretroviral

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ABSTRACT

Objective: To investigate the relationship between antiretroviral therapy (ART) interruption and sociodemographic and clinical variables in hospitalized people living with HIV.

Method: A retrospective, documentary cohort study conducted in a teaching hospital in southern Brazil. Data were collected from August 2023 to April 2024 through the analysis of medical records of patients hospitalized between January 1, 2022, and January 31, 2024. The outcome was ART interruption. Data analysis employed multiple correspondence and cluster analysis.

Results: A total of 219 individuals were included. The group that interrupted ART ($n=98;44,7\%$) and presented worse prognoses was predominantly composed of men, self-identified as Black, with less than eight years of schooling, without a stable partner, and were alcohol users. Clinically, they had high viral load, low lymphocyte counts, and an AIDS diagnosis. In addition, they had a history of previous treatment interruptions, infection-related signs and symptoms, use of a third or subsequent ART regimen, travel time greater than 31 minutes to collect medications, and some progressed to death ($n=68;91,9\%$).

Conclusion: The group with worse prognoses was closely related to social inequities, associated with access barriers, lower quality of care, and difficulties in adhering to ART.

Descriptors: HIV; Acquired Immunodeficiency Syndrome; Highly Active Antiretroviral Therapy; Patient Dropouts; Medication Adherence.

RESUMO

Objetivo: Verificar a relação entre a interrupção do tratamento antirretroviral e as variáveis sociodemográficas e clínicas em pessoas vivendo com HIV hospitalizadas.

Método: Estudo de coorte retrospectiva, documental, realizado em um hospital escola no sul do Brasil. A coleta de dados ocorreu de agosto de 2023 a abril de 2024, por meio da análise de prontuários de pessoas internadas entre 1º de janeiro de 2022 e 31 de janeiro de 2024. O desfecho foi a interrupção do tratamento antirretroviral. A análise dos dados utilizou correspondência múltipla e cluster.

Resultados: Foram incluídas 219 pessoas. O grupo que interrompeu o tratamento antirretroviral ($n=98;44,7\%$) e apresentou piores prognósticos era composto, predominantemente, por homens, de raça/cor autodeclarada preta, com escolaridade inferior a oito anos, sem parceria fixa e que ingeriam álcool. Do ponto de vista clínico, apresentavam carga viral elevada, baixa contagem de linfócitos e diagnóstico de aids. Além disso, tinham histórico de interrupções prévias, sinais e sintomas relacionados à infecção, uso do terceiro esquema ou mais dos antirretrovirais, deslocamento superior a 31 minutos para retirada da medicação e parte evoluiu para óbito ($n=68;91,9\%$).

Conclusão: O grupo com piores prognósticos está intimamente relacionadas a iniquidades sociais, associados a barreiras de acesso, menor qualidade do cuidado e dificuldades de adesão ao tratamento antirretroviral.

Descritores: HIV; Síndrome da Imunodeficiência Adquirida; Terapia Antirretroviral de Alta Atividade; Pacientes Desistentes do Tratamento; Adesão à Medicação.

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RESUMEN

Objetivo: Verificar la relación entre la interrupción del tratamiento antirretroviral (TAR) y las variables sociodemográficas y clínicas en personas que viven con VIH hospitalizadas.

Método: Estudio de cohorte retrospectivo, documental, realizado en un hospital universitario del sur de Brasil. La recolección de datos se llevó a cabo entre agosto de 2023 y abril de 2024, mediante el análisis de historias clínicas de personas hospitalizadas entre el 1 de enero de 2022 y el 31 de enero de 2024. El desenlace fue la interrupción del TAR. El análisis de los datos utilizó correspondencia múltiple y análisis de clúster.

Resultados: Se incluyeron 219 personas. El grupo que interrumpió el TAR ($n=98;44,7\%$) y presentó peores pronósticos estaba compuesto, predominantemente, por hombres, de raza/color autodeclarada negra, con escolaridad inferior a ocho años, sin pareja fija y que consumían alcohol. Desde el punto de vista clínico, presentaban carga viral elevada, bajo recuento de linfocitos y diagnóstico de sida. Además, tenían antecedentes de interrupciones previas, signos y síntomas relacionados con la infección, uso de un tercer esquema o posterior de TAR, tiempo de desplazamiento superior a 31 minutos para retirar la medicación y parte de ellos evolucionó a óbito ($n=68;91,9\%$).

Conclusión: El grupo con peores pronósticos estuvo estrechamente relacionado con inequidades sociales, asociadas a barreras de acceso, menor calidad de la atención y dificultades de adherencia al TAR.

Descriptores: VIH; Síndrome de Inmunodeficiencia Adquirida; Terapia Antirretroviral Altamente Activa; Pacientes Desistentes del Tratamiento; Cumplimiento de la Medicación.

■ INTRODUCTION

An estimated 39.9 million people are living with the Human Immunodeficiency Virus (HIV) worldwide. Since 1981, approximately 88.4 million have been infected, and 42.3 million have died from causes related to Acquired Immunodeficiency Syndrome (AIDS)⁽¹⁾. Although the number of new cases decreased from 3 million in 1997 to 1.3 million in 2023, the infection still constitutes a serious public health issue, especially in developing countries⁽¹⁾. AIDS continues to be among the deadliest infectious diseases due to potentially irreversible clinical complications⁽²⁾.

The HIV epidemic is strongly associated with social determinants, despite the existence of effective interventions, such as Antiretroviral Therapy (ART), which aims to inhibit viral replication, reduce viral load, and reduce virus-related mortality⁽³⁾. In Brazil, the widespread availability of ART contributed to a 25.5% reduction in the AIDS mortality rate between 2012 and 2023, from 5.5 to 4.1 per 100,000 inhabitants⁽⁴⁾. Additionally, the state of Rio Grande do Sul (RS) accounts for nearly half of the HIV cases in the Southern Region of Brazil⁽⁴⁾, maintaining a high annual average of new infections, which underscores the relevance of this study. These advances have transformed HIV infection into a chronic condition, with increased life expectancy and reduced impact on health systems⁽¹⁾.

Despite these advances, challenges persist. Low adherence to ART and complications such as Immune Reconstitution Inflammatory Syndrome (IRIS) contribute to hospitalizations and deaths⁽⁵⁾. Factors associated with discontinuation include male sex, Black or Brown race/skin color, lower education level, socioeconomic vulnerability, alcohol use, high Viral Load (VL), immunosuppression, complex therapeutic regimens, a history of treatment interruptions and barriers to accessing healthcare services, and an increased risk of mortality^(6,7,8,9).

These inequalities are worsened by poor transportation, difficulties accessing basic and specialized services, and fragility in territorialization, which negatively impact

clinical outcomes⁽¹⁰⁾. In this context, the Unified Health System (*Sistema Único de Saúde – SUS*) plays a central role in promoting equity and universal access to care, especially in the provision and distribution of ART⁽¹¹⁾.

Therefore, understanding the factors related to antiretroviral treatment interruption in hospitalized people living with HIV is essential for improving care, guiding interventions, and strengthening adherence. This study aims to investigate the relationship between antiretroviral treatment interruption and sociodemographic and clinical variables in hospitalized people living with HIV.

■ METHOD

Study design

This is a retrospective, documentary cohort study that analyzed electronic medical records of hospitalized individuals hospitalized with HIV, admitted between January 1, 2022, and January 31, 2024, and followed from hospital admission until hospital discharge or death, investigating ART interruption as the outcome. The methodological description of this research was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies.

Study setting

The research was conducted in a clinical inpatient unit for infectious and contagious diseases of a teaching hospital located in the state of Rio Grande do Sul, Brazil. The institution is recognized as a benchmark in technical quality, serves exclusively the Unified Health System (*Sistema Único de Saúde – SUS*), and has regional coverage, providing care to more than 33 municipalities. The clinical unit has 34 beds: 15 for male patients, 15 for female patients, and four for isolation. Furthermore, Rio Grande do Sul accounts for almost half of the HIV cases in the Southern Region of Brazil⁽⁴⁾, maintaining

a high annual average of new infections, which reinforces the relevance of this study setting.

Period

The study period corresponded to hospitalizations between January 1, 2022, and January 31, 2024. Data collection occurred between August 2023 and April 2024.

Sample selection and definition

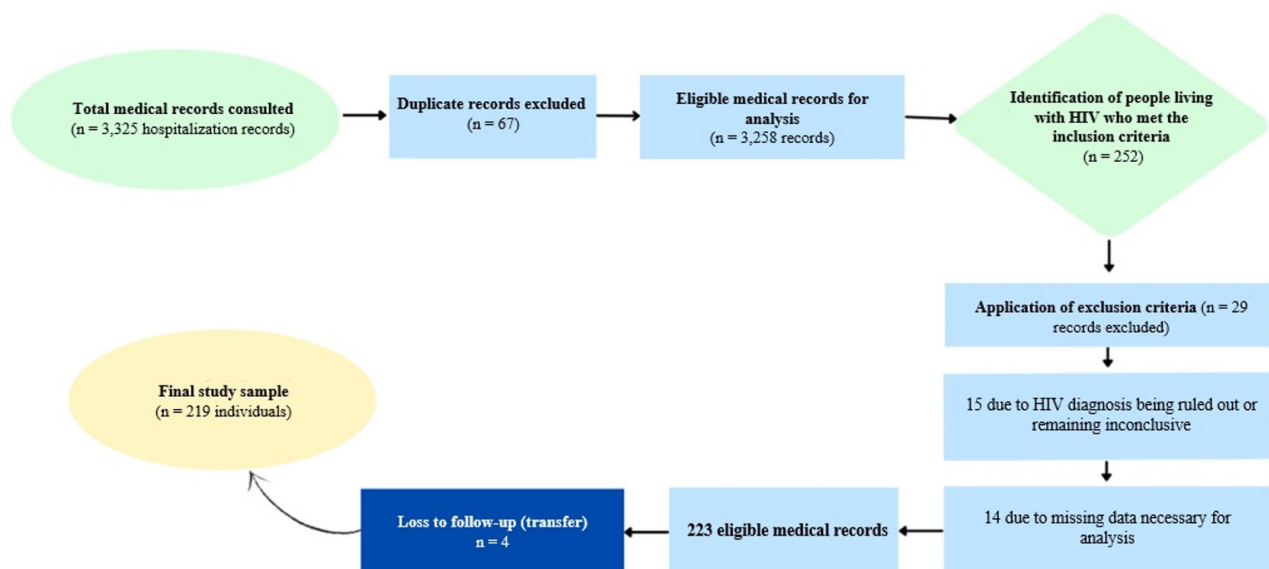
The inclusion criteria were electronic medical records of individuals over 18 years old, diagnosed with HIV, and hospitalized for at least 72 hours, a condition considered necessary to obtain essential information for the study variables. Follow-up occurred from hospital admission until discharge or death.

Medical records missing essential data for the study variables, or those in which the HIV diagnosis was ruled

out, or remained inconclusive during hospitalization, were excluded. Readmissions within the analyzed period were not included to avoid duplication. Additionally, the study period was defined to minimize potential analysis biases, as between 2020 and 2021, 90% of the unit's beds were allocated for the care of patients with COVID-19.

The sample identification process was conducted by analyzing the electronic records of all hospitalizations during the study period, totaling 3,325 records. After removing duplicates, 3,258 records remained. Among these, 252 corresponded to people living with HIV who met the inclusion criteria. Subsequently, exclusion criteria were applied, resulting in a final sample of 223 individuals. In total, 29 records were excluded: 15 because the HIV diagnosis was ruled out or remained inconclusive, 14 due to missing essential information, and 4 due to loss of follow-up after patient transfer, which prevented continued monitoring, as shown in Figure 1.

Figure 1 – Flowchart of the number of individuals eligible for the study (n=219). Santa Maria, RS, Brazil, 2022-2024.



Source: prepared by the author (2025).

Sample size calculation

The sample size was defined considering an average of 220 annual hospitalizations of people living with HIV over the last three years, with a 5% margin of error, a 95% confidence level, and a proportion of 0.5. A minimum of 188 medical records was obtained, a number that was exceeded in the final sample.

Data collection instruments and study variables

Data were collected using an instrument developed by the first author, which underwent content and semantic analysis by five experts in HIV and AIDS. The experts received the instrument via email and were given up to 20 days to respond, evaluating aspects such as comprehension, clarity

of writing, item relevance, presence of ambiguities, and were also able to suggest additional adjustments.

After the first round of evaluations, the recommended changes were made, and the instrument was sent back to the experts for final review, ensuring its clarity, relevance, and applicability.

Data collection was conducted by the main author and a volunteer researcher, both previously trained to standardize procedures and minimize potential biases in data collection.

The outcome of the study was the interruption of anti-retroviral therapy (ART), according to criteria established by the Ministry of Health (Technical Note No. 208/09), defined as failure to collect ART at the pharmacy for a period equal to or greater than three months after the scheduled date, associated with failure to return for consultations within six months⁽¹²⁾.

The instrument included variables related to sociodemographic profile, clinical characteristics, and treatment history. Sociodemographic variables included: gender (male and female), self-reported race/skin color (White and Black/brown race), marital status (single and married), sexual orientation (heterosexual, homosexual, and bisexual/other), stable sexual partner (yes and no), schooling ($\leq$ eight years and $>$ eight years of education), and economic class. Economic class stratification was performed according to the classification already used by the institution where the study was conducted, which categorizes participants' monthly family income as follow: Class A: monthly income above 11,262 BRL; Class B: between 8,641 and 11,261 BRL; Class C: between 2,005 and 8,640 BRL; Class D: between 1,255 and 2,004 BRL; Class E: between 0.00 and 1,254 BRL.

Clinical variables included: alcohol consumption (yes or no), AIDS stage (yes or no), viral load (VL: undetectable, low, or high), and CD4+ T lymphocyte count (≤ 200 cells/mm³ and > 200 cells/mm³). The classification of the AIDS variable followed the criteria of the Ministry of Health⁽⁴⁾, considering clinical deterioration associated with opportunistic infections, VL $> 1,000$ copies/mL and CD4+ T cell < 200 cells/mm³, or explicit diagnosis record (ICD) in the medical record. The viral load was categorized as: undetectable: up to 200 copies/mL (no risk of sexual transmission); low: between 200 and 1,000 copies/mL (minimal risk of sexual transmission); high: over 1,000 copies/mL (significant risk of sexual transmission)⁽⁴⁾. For CD4+ T cell, it was considered low when ≤ 200 cells/mm³ and high when > 200 cells/mm³. The hospitalization outcome was classified as hospital discharge or death.

Therapeutic history variables included: ART interruption (yes and no), history of previous interruption (yes and no), number of ART regimens (first, second, third or more, and

not started), location of HIV diagnosis (hospital, specialized care service/testing and counseling center (SCS/TCC), or primary health care (PHC), reason for testing (opportunistic infection, symptomatology, or rapid testing), and travel time to the medication dispensing unit.

Travel time was estimated based on the distance between the participant's residence and the medication collection unit, using the free Google Maps® tool, with public transportation simulation. Subsequently, the variable was categorized as: ≤ 30 minutes and > 31 minutes.

Data collection

Data were collected from electronic medical records to minimize recall bias. The process involved independent double-checking by two trained researchers affiliated with a graduate program, ensuring greater reliability in extraction of information.

Data processing and analysis

A database was created in an Excel® spreadsheet (Microsoft, version 10, USA), with double data entry and validation, followed by validation to minimize measurement bias and ensure data reliability. Subsequently, the data were transferred to a definitive database, which was analyzed using the Statistical Package for the Social Sciences®, version 24.

For data analysis, descriptive statistics were applied to categorical variables—absolute (n) and relative (%) frequencies. Furthermore, Multiple Correspondence Analysis (MCA) was performed to identify the characteristics among the groups that interrupted ART and the hospitalization factor, since MCA allows for the viability of multivariate data using qualitative categorical variables and encompasses various techniques and algorithms, considering the rows and columns of the data matrix. This method aims to provide answers to explanatory questions. Beyond the need to operate with multiple indicators, it seeks to investigate objects with relational configurations, making a structural approach particularly appropriate.

To identify the combinations between variables and categories that presented the greatest stability in the multidimensional space and explained the highest percentage of variability in the data set, only variables with statistically significant chi-squared and discriminant measures greater than 0.200 were used in the final model. However, variables not meeting this criterion but with theoretical justification for ART interruption were retained in the model, particularly the variables related to previous treatment interruption and gender.

To integrate the clusters, decreasing eigenvalues were used, selecting the first two dimensions, which in the final model explained 61.6% and 19.4% of the data variability. However, the ACM identifies patterns in the relationship between ART interruption and the categories of analysis, but does not quantify the number of individuals interrupting ART within each pattern. The mixed classification method, or cluster analysis, provides information that complements MCA. This technique was applied based on the scores from the first two axes.

Ethical aspects

The study was reviewed and approved by the Research Ethics Committee of the *Universidade Franciscana*, under CAAE number 65479722.0.0000.5306. All ethical guidelines established in Resolution No. 466/2012 of the National Health Council were observed. The Informed Consent Form (ICF) was waived for participants, as the data were obtained from the medical records of individuals who were hospitalized prior to data collection.

RESULTS

Of the 219 medical records of people living with HIV who were hospitalized during the study period, 98 (44.7%) had interrupted antiretroviral therapy (ART), while 121 (55.3%) maintained treatment.

Regarding the sample profile, as shown in Table 1, the group that interrupted ART was predominantly composed of men (63.5%), self-identified as White (69.4%), single (83.6%), without a stable sexual partner (81.6%), with less than eight years of education (88.3%), belonging to socioeconomic class E (91.4%), and with an individual monthly income (75.4%). In contrast, the group that maintained treatment was predominantly composed of women (80.6%), Black/Brown race/skin color (85.7%), married (94.5%), with a stable partner (95.2%), with more than eight years of education (88%), belonging to economic classes C and D (96.8% and 82.8%, respectively), and with a monthly family income (88.6%).

Regarding the characteristics of hospitalization, the average length of stay was 19.21 (SD $\pm$ 9.43) days, with a minimum of five days and a maximum of 45 days.

Table 1 – Sociodemographic characteristics of hospitalized people living with HIV, according to antiretroviral treatment interruption (n=219). Santa Maria, RS, Brazil, 2022-2024.

Variables	Interrupted ART n=98 (44.7%)	Did not interrupt ART n=121 (55.3%)	Total n=219 (100%)
Gender			
Male	80 (63.5%)	46 (36.5%)	126 (100%)
Female	18 (19.4%)	75 (80.6%)	93 (100%)
Race/color			
Black/Brown	84 (69.4%)	37 (30.6%)	121 (100%)
White	14 (14.3%)	84 (85.7%)	98 (100%)
Marital status			
Single	92 (83.6%)	18 (16.4%)	110 (100%)
Married	6 (5.5%)	103 (94.5%)	109 (100%)
Sexual orientation			
Heterosexual	31 (50%)	31 (50%)	62 (100%)

Table 1 – Cont.

Variables	Interrupted ART n=98 (44.7%)	Did not interrupt ART n=121 (55.3%)	Total n=219 (100%)
Homosexual	58 (41.4%)	82 (58.6%)	140 (100%)
Bisexual/other	9 (52.9%)	8 (47.1%)	17 (100%)
Stable partner			
Without stable partner	5 (4.8%)	100 (95.2%)	105 (100%)
With stable partner	93 (81.6%)	21 (18.4%)	114 (100%)
Education level			
≤ eight years	83 (88.3%)	11 (11.7%)	94 (100%)
> eight years	15 (12%)	110 (88%)	125 (100%)
Economic class			
Class C	2 (3.2%)	60 (96.8%)	62 (100%)
Class D	11 (17.2%)	53 (82.8%)	64 (100%)
Class E	85 (91.4%)	8 (8.6%)	93 (100 %)
Monthly income			
Individual	86 (75.4%)	28 (24.6%)	114 (100%)
Family	12 (11.4%)	93 (88.6%)	105 (100%)

Source: Research data, 2025.

Regarding the clinical characteristics of the individuals, it was found that 55.3% (n=121) were not classified as having AIDS, while 44.7% (n=98) presented a condition compatible with the syndrome during hospitalization. Of the total, 59.8% (n=131) had a high viral load (VL), 20.1% (n=44) had a low VL, and 20.1% (n=44) had an undetectable VL for HIV. Similarly, 57.1% (n=125) of people had CD4+ T lymphocyte (CD4+ T cell) counts below 200 cells/mm³, while 42.9% (n=94) maintained values above 201 cells/mm³. Regarding the hospitalization outcome, 33.8% (n=74) of individuals died, of which 91.9% (n=68) belonged to the group that had discontinued antiretroviral treatment.

Regarding treatment interruption, 44.7% (n=98) of individuals were in a situation of ART interruption, with an average interruption period of 14.22 months (SD ± 8.04), a median of 12 months, ranging from a minimum of 5 to a maximum of 47 months.

Regarding the interruption history, 57.1% (n=125) of people had previously interrupted treatment. Regarding the number of treatment regimens used, 13.2% (n=29) had not yet started ART, 26.5% (n=58) were on their first treatment regimen, 21.5% (n=47) on their second, and 38.8% (n=85) were on their third or more regimens.

Regarding the service where the HIV diagnosis occurred, 46.1% (n=101) of the cases were diagnosed in PHC, 38.8% (n=85) no SCS/TCC and 15.1% (n=33) in hospitals. As for the reason individuals sought testing, 42% (n=92) presented signs and symptoms suggestive of HIV infection, 41.1% (n=90) underwent rapid testing, and 16.9% (n=37) sought care due to opportunistic infections. When analyzing the travel time between the medication dispensing unit and individuals' residences, 48.9% (n=93) took less than 30 minutes to reach the location, while 51.1% (n=97) faced a commute longer than 31 minutes.

Based on Table 2, the analysis of the coordinates and contributions of the categories of the study variables revealed patterns of association among the factors analyzed. Dimension 1 (D1) was closely linked to factors such as gender, education level, stable sexual partner, alcohol consumption, AIDS diagnosis, CV, CD4+ T cell count, hospitalization outcome, treatment interruption, previous ART interruption, number of treatment regimens used, and travel time to pick up medication. Dimension 2 (D2), in turn, showed a strong association with the location of HIV diagnosis and the reason for seeking diagnosis.

Table 2 – Discrimination measures for the retained dimensions and average contribution for each study variable, Santa Maria, RS, Brazil, 2022-2024 (n=219).

Variables	Dimension 1	Dimension 2	
	Discrimination measures	Discrimination measures	Average contribution
Gender	0.302	0.026	0.164
Race/Color	0.434	0.032	0.233
Schooling	0.627	0.014	0.320
Stable partner	0.693	0.015	0.354
Alcoholism	0.677	0.009	0.343
AIDS	0.811	0.000	0.406
Viral load	0.622	0.172	0.397
CD4+ T cells⁺	0.568	0.165	0.367
Death	0.577	0.003	0.290
Treatment interruption	0.895	0.028	0.462
Previous interruption history	0.389	0.121	0.255
Number of ART regimens⁺	0.794	0.742	0.768
Diagnosis location	0.702	0.783	0.743

Table 2 – Cont.

Variables	Dimension 1	Dimension 2	
	Discrimination measures	Discrimination measures	Average contribution
Reason for seeking diagnosis	0.312	0.788	0.550
Travel time to medication unit	0.834	0.014	0.424
Total active	9.236	2.914	6.075
% variance explained	61.575	19.425	40.500

* CD4+ T cells = CD4+ T lymphocytes; †ART = Antiretroviral Therapy. Source: Research data, 2025.

Figure 2 presents a graphical representation of the variable categories that emerged from the perceptual map, allowing the identification of three clusters of people living with HIV.

Regarding the sociodemographic characteristics of **Group 1**, it was found that individuals who did not interrupt ART were predominantly women, self-identified as White, with more than eight years of education, and with stable partners. Clinically, treatment adherence was associated with the absence of alcohol consumption, diagnosis through rapid testing performed at the SCS/TCC, CD4+ T cell count greater than 201 cells/mm³, low or undetectable viral load, and use of the first or second ART regimen. Regarding the healthcare system, it was observed that shorter travel time to access ART and no previous history of treatment interruption were associated to favorable outcomes, such as hospital discharge.

In contrast, **Group 2** comprised those who interrupted ART and presented a worse clinical prognosis. This group was predominantly composed of men, self-identified as Black, with less than eight years of education, and no stable partner. Clinically, they are characterized by alcohol consumption, high VL, CD4+ T cell counts below 200 cells/mm³, and manifestations of symptoms consistent with AIDS. Additionally, regarding the health system, these individuals were diagnosed in PHC, sought the service due to the presence of signs and symptoms, faced a travel time of more than 31 minutes to access ART, had a previous history of treatment interruption, and had three or more ART regimens, factors that were associated with an outcome of death.

Group 3, in turn, was characterized by a diagnosis due to opportunistic infections, with HIV detected in the hospital unit, and who were starting ART.

Next, the cluster analysis is presented, illustrated through a perceptual map (Figure 2).

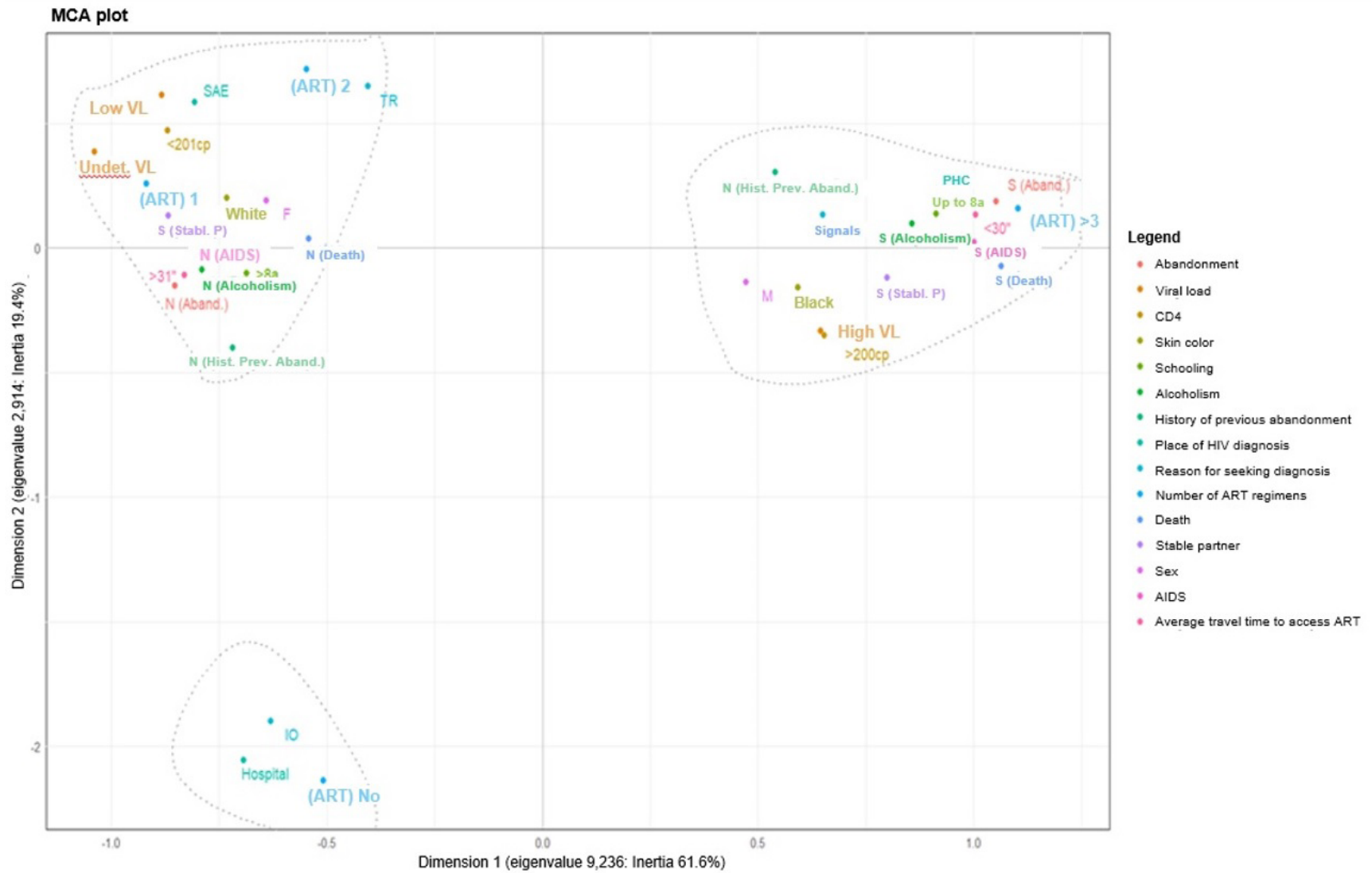
The variables of marital status, sexual orientation, economic class, and length of hospital stay were not included in the model due to a lack of statistical significance in the chi-square test or an average contribution below 0.200.

DISCUSSION

This study aimed to recognize the relationship between ART interruption among hospitalized people living with HIV and their sociodemographic, clinical, and treatment history characteristics. Through MCA and cluster analysis, it was possible to identify three distinct groups, highlighting the complexity of the object under study.

The results of this study, regarding access to healthcare services, showed that Group 2, composed of people in more severe clinical conditions, faced a travel distance to the medication collection unit as a barrier, as this group included those who took more than 31 minutes to travel to the ART collection unit. In a Brazilian study, participants reported that difficulty accessing services was one of the main factors influencing non-adherence to treatment⁽⁸⁾. Similarly, a study conducted in South Africa found that long distances, waiting times for consultations, stigma, and discrimination were factors significantly associated with non-adherence to ART⁽⁹⁾.

Figure 2 – Multiple correspondence analysis map according to characteristics of antiretroviral treatment interruption among hospitalized people living with HIV, Santa Maria, RS, Brazil, 2022-2024.



Source: prepared by the author (2025).

A scoping review showed that people living with HIV and living in remote areas face greater challenges regarding access to and adherence to ART, difficulties worsened by the centralization of specialized care and weak coordination with PHC⁽¹³⁾. In China, an effective strategy to improve adherence was to bring health workers closer to active case finding and medication monitoring activities, which contributed to better treatment outcomes⁽¹⁴⁾.

The findings of this study suggest that treatment interruption is associated with diagnosis in PHC. This may indicate a breakdown in the bond between the health care unit and the individual, as the individual is referred to specialized services⁽¹⁵⁾. This evidence highlights the disruption of one of the principles of PHC: longitudinality. PHC is embedded in the community where these individuals live, which qualifies it as responsible for promoting a better quality of life through follow-up and continuity of care, rather than simply transferring its responsibility to specialized care services⁽¹⁵⁾.

Another important aspect is the reason for seeking diagnosis. Individuals who sought care due to signs and symptoms characteristic of HIV infection were the same ones who later interrupted treatment. Otherwise, those who sought diagnosis through regular rapid testing belonged to the group of those who did not interrupt treatment, a result also observed in Uganda, reinforcing the need for routine screening⁽¹⁶⁾.

A study conducted in Germany found that late diagnosis is associated with a higher risk of HIV transmission, progression to AIDS, early death, and complications related to ART⁽¹⁷⁾. Initiating treatment on the same day as diagnosis is considered effective in reducing viral load and the transmissibility of the virus. However, this approach may delay important complementary tests. Even so, it is recommended that such tests be carried out after ART initiation as a strategy to strengthen the patient's bond with the healthcare service⁽¹⁸⁾.

Furthermore, the main consequence of ART interruption among people living with HIV is death, as evidenced by those with a worse prognosis. A cohort study in Ethiopia linked non-adherence to clinical and immunological deterioration, highlighting the importance of continuous monitoring of adherence as a strategy to reduce hospitalizations and complications⁽¹⁹⁾. In the present study, the mortality rate was 33.8% (74 deaths), a high figure compared to other settings, such as in Nigeria, where a mortality rate of 19.2% was observed among hospitalized patients, mainly associated with opportunistic infections⁽⁷⁾. Additionally, another study found a higher prevalence of death among men with high viral load, low CD4+ T cell count, and an AIDS diagnosis⁽⁶⁾.

This study confirmed the association between undetectable or low VL and ART adherence, a finding also observed in research in the United States, which identified adherence

as the main factor for viral suppression and improved CD4+ T cell count⁽²⁰⁾. Thus, continuous monitoring of adherence and VL is essential, considering that elevated VL directly contributes to increased HIV transmissibility, morbidity, and mortality⁽⁷⁾. Our findings support this evidence, as the group that interrupted treatment presented with high VL and worse clinical prognosis, reinforcing the need for constant surveillance and early intervention.

In South Korea, it was observed that hospitalized individuals with high viral load and low CD4+ T cell count were on more advanced ART regimens, indicating a higher likelihood of non-adherence⁽²¹⁾. Studies from Poland reinforce the importance of ART, highlighting its association with reduced transmission, cost-effectiveness, and increased life expectancy among people living with HIV⁽²²⁾. These data, even in different sociocultural contexts, demonstrate that low ART adherence remains a global challenge.

Men presented lower ART adherence and worse prognoses, which may be related to cultural factors that associate masculinity with the repression of care needs. Studies show that men are more likely to receive a late diagnosis and to interrupt treatment⁽²³⁾. In contrast, the women in this study had low or undetectable viral loads and higher CD4+ T cell counts, maintaining better adherence to ART. Similar results were observed in South Africa, where women demonstrated greater engagement with self-care and clinical follow-up⁽²⁴⁾.

Analysis of Figure 1 suggests that individuals of Black race/skin color, with lower education level and income, have a more vulnerable profile and are associated with unfavorable treatment outcomes. Studies indicate that factors such as race/skin color, education level, and income influence ART adherence. In the United States, Black people with low education and income were less likely to access treatment, while in Brazil, brown people with a similar socioeconomic profile showed good adherence^(25,26). These findings reinforce the need to consider individual context and specific vulnerabilities when planning care strategies, prioritizing person-centered approaches, both in hospital and pre-hospital settings.

Comorbidities and lifestyle habits, such as alcohol consumption, are associated with lower adherence to ART, less connection with healthcare, and worse clinical outcomes⁽²⁷⁾. In this study, people who consumed alcohol were those who discontinued treatment and had the most severe prognoses. Alcohol consumption can also promote treatment resistance, compromising its effectiveness⁽²⁷⁾. Data from South Africa reinforce this negative impact, especially among men, Black or Brown individuals, and those with lower levels of education, a profile associated with lack of viral suppression and a higher risk of hospitalization⁽²⁸⁾.

Moreover, group three in the study consisted of participants who had not yet started ART, as the diagnosis occurred during hospitalization. A study indicates that, although late diagnosis is associated with worse prognoses due to the presence of opportunistic infections, initiating treatment during hospitalization may favor commitment to care after discharge⁽²⁹⁾. However, the present study is limited to the hospitalization period and does not include follow-up of these cases.

Given these findings, stands out the importance of expanding actions in specialized services and Primary Health Care to ensure comprehensive care for people living with HIV. This includes clinical monitoring, early initiation of ART, and multiprofessional follow-up, all of which are fundamental measures for reducing hospitalizations⁽⁴⁾. Furthermore, the creation of preventive programs is also essential to avoid treatment interruption⁽¹⁾. The effectiveness of these strategies depends on the commitment of governmental entities to implement public policies⁽³⁰⁾. The study also reinforces the need to strengthen support institutions, ensuring timely access to ART, comprehensive support, stigma reduction, and continuity of care, with a focus on adherence and improved clinical outcomes.

Likewise, the importance of intensifying the actions recommended by the HIV care network in PHC is emphasized, focusing on monitoring the quality of these services. This is essential to reduce hospitalizations and ART interruption rates and can be achieved through the monitoring of care quality indicators⁽³⁰⁾.

It is worth noting that medical record research represents a relevant strategy for monitoring the outcome of interest over time, allowing for the analysis of long-term results. However, some information may be incomplete, inaccurate, or missing from the system. Furthermore, some clinical data were recorded based on information provided by participants during the medical history and when completing forms, either at the time of admission or throughout their hospitalization. This may introduce bias, as individuals might provide answers they perceive as more convenient. These limitations are inherent to studies that rely on secondary data as their main source of information.

The contributions to nursing practice are significant, as the study offers a detailed profile of the factors that lead to non-adherence to ART. Based on these findings, healthcare professionals, especially nursing staff, will be able to develop more effective care strategies focused on the specific needs

of the hospitalized population, such as interventions to mitigate access barriers and strengthen the connection with the healthcare service.

Moreover, the study aims to identify the factors that led to hospitalization, infection worsening, and ART interruption. The findings may contribute to the planning and implementation of interventions tailored to the needs of people living with HIV, such as increased rapid testing, counseling, active case finding, and early treatment.

Considering the compilation of sociodemographic and clinical information related to treatment interruption and healthcare services, the study provides tangible data that can help reduce AIDS-related hospitalization rates, ART interruption rates, and mortality associated with the syndrome, contributing to the development of public health policies.

■ CONCLUSION

The study showed that people living with HIV who discontinued ART presented a profile marked by greater social and clinical vulnerability, associated with worse outcomes during hospitalization. This group was predominantly characterized by male gender, self-reported Black race/skin color, with less than eight years of education, and the absence of a stable partner. Clinically, it was more associated with harmful alcohol use, high viral load, CD4+ T-cell count below 200 cells/mm³, AIDS diagnosis, previous history of treatment abandonment, use of a third or more treatment regimen, and the occurrence of death. These findings highlight the association between treatment interruption and greater clinical severity, which translated into greater vulnerability and worse prognoses.

More than pointing out isolated factors, the study contributes by identifying a profile of greater vulnerability that remains shaped by social and structural inequities, which directly impact access, quality of care, and continuity in treatment. This reinforces that the social determinants of health continue to strongly influence the fight against HIV and AIDS, keeping them as persistent public health problems.

From a professional practice perspective, these results highlight the need for care strategies that integrate social and biomedical dimensions, strengthening the coordination between Primary Care and specialized services, decentralizing treatment, and providing longitudinal follow-up. Such measures can help reduce inequalities in care, promote treatment adherence, and prevent further episodes of ART interruption, promoting better clinical outcomes.

REFERENCES

1. Joint United Nations Programme on HIV and AIDS (UNAIDS). The path that ends AIDS: UNAIDS Global AIDS Update 2023 [Internet]. Geneva: Joint United Nations Programme on HIV/AIDS; 2023 [cited 2025 Jan 2]. Available from: https://thepath.unaids.org/wp-content/themes/unaids2023/assets/files/2023_report.pdf
2. Siripurapu R, Ota Y. Human immunodeficiency virus: opportunistic infections and beyond. *Neuroimaging Clin N Am*. 2023;33(1):147–65. <https://doi.org/10.1016/j.nic.2022.07.014>
3. Matsuda K, Maeda K. HIV Reservoirs and Treatment Strategies toward Curing HIV Infection. *Int J Mol Sci*. 2024;25(5):21–6. <https://doi.org/10.3390/ijms25052621>
4. Ministério da Saúde (BR), Protocolo Clínico e Diretrizes Terapêuticas para Manejo da Infecção pelo HIV em Adultos: Módulo 1: Tratamento [Internet]. 2024 [cited 2025 Mar 05]. Available from: https://www.gov.br/aids/pt-br/central-de-conteudo/pcdts/pcdt_hiv_modulo_1_2024.pdf
5. Vinhaes C, Araujo-Pereira M, Tiburcio R, Cubillos-Angulo J, Demitto F, Akrami K, et al. Systemic inflammation associated with immune reconstitution inflammatory syndrome in persons living with HIV. *Life (Basel)*. 2021;11(1):65. <https://doi.org/10.3390/life11010065>
6. Liu Y, Hao Y, Xiao J, Wu L, Liang H, Han J, et al. Trends in rates and causes of hospitalization among people living with HIV in the antiretroviral therapy era: a retrospective cohort study in China, 2008–2020. *Front Public Health*. 2022;10:e1000942. <https://doi.org/10.3389/fpubh.2022.1000942>
7. Omololu A, Onukak A, Effiong M, Oke O, Isa SE, Habib AG. Hospitalization and mortality outcomes among adult persons living with HIV in a tertiary hospital in South-western Nigeria: a cross-sectional study. *PLOS Glob Public Health*. 2024;4(7):e0003487. <https://doi.org/10.1371/journal.pgph.0003487>
8. Bielick C, Strumpf A, Ghosal S, McMurry T, McManus KA. National Hospitalization Rates and In-Hospital Mortality Rates of HIV-Related Opportunistic Infections in the United States, 2011–2018. *Clin Infect Dis*. 2024;79(2):487–97. <https://doi.org/10.1093/cid/ciae051>
9. Poojar B, Kamath A, Rao SB, Ullal SD, Ramapuram J, Yadiyal MB, et al. A prospective study of the medication regimen complexity index and hospitalization due to adverse drug reactions among people living with HIV. *Medicina (Kaunas)*. 2024;60(10):1705. <https://doi.org/10.3390/medicina60101705>
10. Bouabida K, Chaves BG, Anane E. Challenges and barriers to HIV care engagement and care cascade: viewpoint. *Front Reprod Health*. 2023;5:e1201087. <https://doi.org/10.3389/frph.2023.1201087>
11. Grangeiro A, Ferraz D, Magno L, Zucchi EM, Couto MT, Dourado I. Forty years of the Brazilian response to HIV: reflections on the need for a programmatic shift and policy as a common good. *Cad Saúde Pública*. 2023;39:e00199423. <https://doi.org/10.1590/0102-311XPT199423>
12. Ministério da Saúde (BR). Nota Técnica nº 208/2009 [Internet]. 2009 [cited 2025 Mar 19]. Available from: <https://antigo.aids.gov.br/pt-br/legislacao/nota-tecnica-no-2082009>
13. Piran CMG, Magalhães LG, Shibukawa BMC, Rissi GP, Merino MFGL, Furtado MD. Treatment non-adherence or abandonment among adolescents and young individuals living with HIV/AIDS: a scoping review. *Aquichan*. 2023;23(2):e2322. <https://doi.org/10.5294/aqui.2023.23.2.2>
14. Meng X, Yin H, Ma W, Gu J, Lu Z, Fitzpatrick T, et al. Peer-led community-based support services and HIV treatment outcomes among people living with HIV in Wuxi, China: propensity score-matched analysis of surveillance data from 2006 to 2021. *JMIR Public Health Surveill*. 2023;9:e43635. <https://preprints.jmir.org/preprint/43635>
15. Damião JJ, Agostini R, Maksud I, Filgueiras S, Rocha F, Maia AC, et al. Caring for People Living with HIV/Aids in Primary Health Care: a new agenda for facing vulnerabilities?. *Saúde debate*. 2022;46(132):163–74. <https://doi.org/10.1590/0103-1104202213211>
16. Lofgren SM, Tsui S, Atuyambe L, Ankunda L, Komuhendo R, Wamala N, et al. Barriers to HIV care in Uganda and implications for universal test-and-treat: a qualitative study. *AIDS Care*. 2022;34(5):597–605. <https://doi.org/10.1080/09540121.2021.1946000>
17. Boesecke C, Schellberg S, Schneider J, Schuetfort G, Stocker H. Prevalence, characteristics and challenges of late HIV diagnosis in Germany: an expert narrative review. *Infection*. 2023;51(5):1223–39. <https://doi.org/10.1007/s15010-023-02064-1>
18. Pérez-González A, Suárez-García I, Ocampo A, Poveda E. Two-Drug Regimens for HIV—current evidence, research gaps and future challenges. *Microorganisms*. 2022;10(2):433. <https://doi.org/10.3390/microorganisms10020433>
19. Wedajo S, Degu G, Deribew A, Ambaw F. Treatment failure, death, and predictors among PLWHIV on second-line antiretroviral therapy in Dessie Comprehensive Specialized Hospital, northeast Ethiopia: a retrospective cohort study. *PLoS One*. 2022;17(6):e0269235. <https://doi.org/10.1371/journal.pone.0269235>
20. Chou TC, Maggirwar NS, Marsden MD. HIV persistence, latency, and cure approaches: where are we now? *Viruses*. 2024;16(7):1163. <https://doi.org/10.3390/v16071163>
21. Oh KS, Han E. A comparison of medication adherence and viral suppression in antiretroviral treatment-naïve patients with HIV/AIDS depending on the drug formulary. *PLoS One*. 2021;16(1):e0245185. <https://doi.org/10.1371/journal.pone.0245185>
22. Kowalska JD, Wójcik G, Rutkowski J, Antonyak S, Siewaszewicz E. Rapid antiretroviral treatment start seems as vital and cost-effective strategy in Central and Eastern Europe. *Przegl Epidemiol*. 2022;76(3):304–13. <https://doi.org/10.32394/pe.76.29>
23. Cushnie A, Reintjes R, Lehtinen-Jacks S, Figueroa JP. Correction: HIV program outcomes for Jamaica before and after “Treat All”: a population-based study using the national treatment services database. *PLoS One*. 2024;19(5):e0303723. <https://doi.org/10.1371/journal.pone.0303723>
24. Maragh-Bass AC, Hendricks SD, Aimone EV, Knowlton AR. ‘The Woman Gives’: Exploring gender and relationship factors in HIV advance care planning among African American caregivers. *J Clin Nurs*. 2021;30(15):2331–2347. <https://doi.org/10.1111/jocn.15772>
25. Zalla LC, Cole SR, Eron JJ, Adimora AA, Vines AI, Althoff KN, et al. Association of race and ethnicity with initial prescription of antiretroviral therapy among people with HIV in the US. *JAMA*. 2023;329(1):52–62. <https://doi.org/10.1001/jama.2022.23617>
26. Miranda MMF, Oliveira DR, Quirino GS, Oliveira CJ, Pereira MLD, Cavalcante EGR. Adherence to antiretroviral therapy by adults living with HIV/aids: a cross-sectional study. *Rev Bras Enferm*. 2022;75(2):e20210019. <https://doi.org/10.1590/0034-7167-2021-0019>

27. Jiao K, Wei R, Lin Y, Li C, Wang L, Ma W. Alcohol consumption and utilization of HIV prevention services among men who have casual sex with women in China. *AIDS Care*. 2023;35(4):564-571. <https://doi.org/10.1080/09540121.2022.2142928>
28. Parry CDH, Myers B, Londani M, Shuper PA, Janse-van RC, Manda SOM, et al. Motivational interviewing and problem-solving therapy intervention for patients on antiretroviral therapy for HIV in Tshwane, South Africa: a randomized controlled trial to assess the impact on alcohol consumption. *Addiction*. 2023;118(11):2164-76. <https://doi.org/10.1111/add.16278>
29. Davy-Mendez T, Napravnik S, Hogan BC, Althoff KN, Gebo KA, Moore RD. Hospitalization Rates and Causes Among Persons With HIV in the United States and Canada, 2005-2015. *J Infect Dis*. 2021;223(12):2113-23. <https://doi.org/10.1093/infdis/jiaa661>
30. Varadarajan M, Blackburn S, Girometti N, Hicks A, Senkoro E, Candela C, et al. Implementation of a multidisciplinary approach to care for people with HIV aged 80 years and over. *Int J STD AIDS*. 2025;36(1):65-71. <https://doi.org/10.1177/09564624241286558>

■ **Data and material availability:**

Access to the dataset is available upon request from the corresponding author.

■ **Authorship contribution:**

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