






# Timely care linkage of people living with HIV in a reference health service, Belo Horizonte, Minas Gerais

*Oportunidade de vinculação de pessoas vivendo com HIV em um serviço especializado de saúde, Belo Horizonte (MG)*

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**ABSTRACT:** *Introduction:* Linkage is a critical step in the ongoing care of human immunodeficiency virus (HIV/aids) infection and is essential for providing access to antiretroviral therapy, as well as comprehensive care. *Methodology:* Cross-sectional study on people living with HIV (PLHIV), aged  $\geq 18$  years old, linked between January and December 2015, in a referral service for outpatient and hospital care specialized in HIV/AIDS in Belo Horizonte, Minas Gerais. Linkage time was defined as the time from diagnosis to service linkage. Timely care linkage was considered when this time was  $\leq 90$  days. Data were collected through clinical records. A logistic regression analysis with a confidence interval of 95% (95%CI) was performed. *Results:* Among 208 patients, most of them were males (77.8%) with a mean age of 39 years. About 45% presented AIDS-defining conditions at the moment of linkage. Linkage time presented a mean of  $138 \pm 397$  days. And timely linkage occurred for 76.9% of the patients. The variables associated with timely care linkage were: age  $\geq 48$  years (odds ratio – OR = 8.50; 95%CI 1.53 – 47.28), currently working (OR = 3.69; 95%CI 1.33 – 10.25) at the time of linkage, and present CD4+ T lymphocyte count (CD4+ T)  $\leq 200$  cells/mm<sup>3</sup> at the time of HIV diagnosis (OR = 4.84; 95%CI 1.54 – 15.18). There was an important proportion of timely care linkage among PLHIV, but with late diagnosis. *Conclusion:* Interventions should be targeted at younger people with higher CD4+ T lymphocyte counts, in order to better provide continuous HIV care.

**Keywords:** HIV. AIDS. Continuity of Patient Care.

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**RESUMO: Introdução:** A vinculação é um passo fundamental para o cuidado contínuo da infecção pelo vírus da imunodeficiência humana (HIV / aids), sendo essencial para proporcionar o acesso à terapia antirretroviral, bem como ao cuidado integral. **Metodologia:** Estudo transversal, com pessoas vivendo com HIV (PVHIV), idade  $\geq 18$  anos, vinculadas entre janeiro e dezembro de 2015, em um serviço de referência para assistência ambulatorial e hospitalar especializada em HIV / aids em Belo Horizonte (MG). O tempo de vinculação foi definido como o tempo do diagnóstico até a vinculação ao serviço. Considerou-se vinculação oportuna quando esse tempo foi menor ou igual a 90 dias. Os dados foram coletados por meio de prontuários clínicos. Realizou-se análise de regressão logística com intervalo de confiança de 95% (IC95%). **Resultados:** Entre os 208 pacientes, a maioria era do sexo masculino (77,8%) com idade média de 39 anos. Cerca de 45% apresentaram condições definidoras de aids na vinculação. O tempo de vinculação apresentou média de  $138 \pm 397$  dias, e a vinculação oportuna ocorreu para 76,9% dos pacientes. As variáveis associadas com a vinculação oportuna foram: ter idade  $\geq 48$  anos (*odds ratio* — OR = 8,50; IC95% 1,53 – 47,28), estar trabalhando (OR = 3,69; IC95% 1,33 – 10,25) no momento da vinculação e apresentar contagem de linfócitos T CD4 (LT CD4+)  $\leq 200$  células/mm<sup>3</sup> no momento do diagnóstico de HIV (OR = 4,84; IC95% 1,54 – 15,18). Observou-se proporção importante de vinculação oportuna entre as PVHA, porém com diagnóstico tardio. **Conclusão:** Intervenções devem ser direcionadas para pessoas mais jovens e com maior contagem de LT CD4+, visando uma melhor prestação de cuidados contínuos em HIV.

**Palavras-chave:** HIV. Aids. Continuidade da Assistência ao Paciente.

## INTRODUCTION

The spread of the human immunodeficiency virus (HIV) epidemic in heterogeneous populations in Brazil and around the world has paralleled technological advances achieved as treatment, including high-potency antiretroviral drugs, increased availability and accessibility<sup>1</sup> to health services, testing laboratory tests for early diagnosis and follow-up of HIV infection treatment. This has resulted in improved access to antiretroviral therapy (ART), inherent in the supply and continued availability, including treatment for opportunistic co-infections<sup>2,3</sup>.

In addition, there are updates to the World Health Organization (WHO) recommendations to start treatment more timely, regardless of CD4 T lymphocyte count (CD4+ T) and viral load (VL) of people living with HIV (PLHIV)<sup>2,3</sup>. These advances have resulted in a significant drop in mortality, a reduction in opportunistic infections, and a decrease in the likelihood of HIV transmission. In addition, studies also portray improvement in the quality of life of PLHIV<sup>4,5</sup>.

Despite these advances, many individuals are still beginning treatment care for HIV infection with a CD4+ T count below 200 cells/mm<sup>3</sup>, or with an AIDS-defining event. This more advanced or untimely initiation of care is generally associated with poor immune recovery<sup>6,7</sup> and shorter survival<sup>8</sup>, in addition to higher direct health costs and social losses<sup>9</sup>, as well as increased risk of HIV transmission<sup>10</sup>.

Thus, timely detection of HIV infection is desirable for all populations. The earlier the infection is diagnosed and the faster you are linked to a specialized referral service for follow-up treatment, the better the prognosis of the disease and the lower the chance of virus transmission. The quality of health care for the treatment of HIV infection requires individuals to perform diagnostic tests, to be linked to the service, to remain in care, to start ART, and to achieve viral load suppression<sup>11,12</sup>. This dynamic is known as the care cascade, and its understanding is essential for controlling HIV transmission<sup>9,10</sup>.

Linkage is defined as the first consultation with a prescribing authority in a referral care service after the diagnosis of HIV<sup>13,14</sup>. It is the second step in the cascade of continuous care after diagnosis and is essential for assessing patient health and providing access to ART<sup>15</sup> as well as prevention interventions<sup>12</sup>.

Clinically, timely care linkage to HIV is associated with improved health and quality of life, as patients benefit from ART, as well as immunizations, screening, and prophylaxis for opportunistic infections and other sexually transmitted diseases<sup>16,17</sup>. Thus, the objective of this study was to analyze the linkage and the factors associated with it in patients treated at a specialized HIV service of the public health system of Minas Gerais.

## METHODS

Analytical, cross-sectional study conducted in PLHIV who were linked to a specialized outpatient service (SOS) in HIV of a hospital belonging to the public health network of Minas Gerais. This service has regional and state strategic importance, at secondary and tertiary levels of complexity, being the hospital reference of Belo Horizonte (Minas Gerais), of importance in the care network for PLHIV. For this study, it was considered that the successful treatment of HIV infection has required processes from the initial diagnosis to clinical outcomes.

Patients treated at the first consultation at the SOS of the referred hospital, from January to December 2015, aged 18 years old or older and diagnosed with HIV infection were included. For linkage analysis, women who were pregnant or who became pregnant throughout the project, individuals who had previously received outpatient care in another SOS and those who were under home care were excluded.

Data collection was performed using a standardized printed form based on instruments developed and published mainly by Guimarães et al.<sup>18</sup> and Mugavero et al.<sup>13</sup>. An investigation was carried out in the clinical records (both physical and electronic ones) and also in the Logistic Control System of Medicines and in the CD4/CD8 and VL Laboratory Examination Control System of the Ministry of Health.

The forms were typed into the EpiInfo<sup>®</sup> 3.5.4 software. The quality of data collection and typing was double verified in 10% of the sample by a second researcher. The agreement

between examiners was assessed by Kappa statistics ( $k = 0.92$ ), indicating perfect agreement in both cases<sup>19</sup>.

The measure of linkage (dependent variable) was constructed using clinical records. Linkage was defined as the first consultation with a care provider in the SOS after the diagnosis of HIV<sup>20,21</sup>. Linkage time was determined as the period from diagnosis to service linkage, measured by the difference between the date of the first examination of the HIV diagnosis and the date of the first consultation<sup>13,22</sup>. For analysis purposes, this time was dichotomized and was considered timely when it was under or equal to 90 days<sup>13,14</sup>.

Independent variables were classified into three groups:

- sociodemographic: age in percentiles (19–30 years, 31–47 years and  $\geq 48$  years), gender (male, female), skin color (white, black and brown), education level ( $> 8$  years and  $\leq 8$  years), marital status (married/stable union, single, widowed, divorced/separated), children (yes or no), place of residence (Belo Horizonte or other municipality), work (yes or no);
- lifestyle habits: current or past use of alcohol, tobacco, cocaine, crack and other drugs (yes or no);
- clinic: VL at diagnosis, immune condition (CD4+ T) at diagnosis and at first visit, clinical condition, comorbidities, coinfection, and psychiatric diagnosis at first visit.

In order to obtain clinical data on CD4+ T and plasma VL counts in the diagnosis, the exams performed on the same date as the diagnosis of HIV infection or up to seven days after the initiation of ART<sup>22</sup> were taken into account. For clinical data for the first visit, test results (CD4+ T and plasma VL) were observed within three months before or after the first visit. The patient's clinical condition was considered according to the classification for HIV<sup>23</sup> diseases (categories A, B and C) at the first outpatient visit. The comorbidities were those reported at the first visit (immunological diseases, cancers and metabolic diseases – and diabetes, hypertension, dyslipidemia, hypertriglyceridemia, hypothyroidism). Coinfections were the infectious diseases recorded at the first visit or in the discharge summary of hospitalized patients. The psychiatric diagnosis was also obtained by recording the first consultation.

Descriptive analysis of the variables was performed, with frequency distribution tables and their respective 95% confidence intervals (CI). Pearson's  $\chi^2$  test was used to compare the proportions of categorical variables between groups, adopting a significance level of 5%. The measure of association was obtained by odds ratio (OR). To evaluate the association between timely care linkage and independent variables, multiple logistic regression was performed. Variables with  $p \leq 0.20$  or of clinical and/or epidemiological importance were included in the multiple logistic model, remaining those with  $p < 0.05$ . The Hosmer-Lemeshow test was employed to verify the adequacy of the

final model. Data were analyzed using the Statistical Package for Social Sciences software, version 22.

This study is part of the Antiretroviral Therapy Effectiveness in Coinfected Subjects (*Efetividade em Coinfectados da Terapia Antirretroviral – ECOART*) project in people living with human immunodeficiency virus (HIV)/AIDS, HIV/tuberculosis, HIV/leprosy and HIV/visceral leishmaniasis in Belo Horizonte, with the approval of the Research Ethics (COEP) of the Federal University of Minas Gerais, under Certificate of Presentation for Ethical Appreciation (CAAE) number 31192914.3.0000.5149, and the Eduardo de Menezes Hospital of the Minas Gerais State Hospital Foundation (FHEMIG), under CAAE Number 31192914.3.3001.5124.

## RESULTS

Between January and December 2015, 208 PLHIV were outpatient-linked at the assessed health service. Among the sociodemographic characteristics, most of them were males (77.9%), with mean age  $\pm$  standard deviation (SD) =  $39.3 \pm 11.9$  and median of 38 years. There was a higher proportion (40.1%) of the level of education equivalent to complete high school. Regarding marital status, the number of single, widowed and separated was almost three times higher than those who lived with a spouse or partner. The percentage of people with autonomous occupational activities (regular and occasional) and fixed jobs (51.8%) was very close to that of unemployed (48.2%) (Table 1).

As for the clinical characteristics, there was great variation and dispersion between the values of the VL count in the diagnosis of HIV. This value ranged from 140 cells/mm<sup>3</sup> to the maximum detectable limit of 10,000,000 cells/mm, with a mean  $\pm$  SD =  $351,000 \pm 1,046,565$  and a median of 81,000 copies/mL. The CD4+ T count presented mean  $\pm$  SD =  $284.1 \pm 283.1$  cells/mm<sup>3</sup>, median equal to 183.5 cells/mm<sup>3</sup>, ranging from 1 to 1,315 cells/mm<sup>3</sup>. VL and CD4+ T count values were absent for 33 patients.

Regarding the clinical condition in the first consultation, there was a predominance of patients classified in category C (43.7%), which showed that almost half were in AIDS-defining conditions. It was found that one-third of the individuals had some kind of comorbidity, such as psoriasis, arthrosis, obesity, glaucoma, ichthyosis, asthma, chronic kidney disease, cancer and metabolic disease (diabetes, hypertension, dyslipidemia, hypertriglyceridemia, hypothyroidism), among others.

Among patients with some type of comorbidity, 27.1% had two or more of them (Table 1). Regarding co-infections, more than half (67.8%) had infectious diseases at the time of service linkage. Among them, 13.9% were sexually transmitted infections (STI) and 10.6% were tuberculosis and leishmaniasis.

Among the registered mental disorders, 20.2% of the patients were diagnosed with psychosis, depression with psychotic symptoms and bipolar disorder, depression and anxiety,

Table 1. Sociodemographic and clinical characteristics and behavioral lifestyle of people with the human immunodeficiency virus (HIV) linked to a reference service for HIV treatment, Belo Horizonte, Minas Gerais, Brazil, 2015 (n = 208).

Characteristics	n*	%
Sociodemographic		
Gender (male)	162	77.8
Age (in years) (31–47)	104	50.0
Education ( $\leq$ 8 years of schooling)	92	50.5
Color (brown/black)	158	76.3
Marital status (single/widowed/separated)	147	71.4
Children (yes)	93	52.5
Place of residence (Belo Horizonte) (yes)	146	70.2
Working (yes)	98	51.8
Health service entry route (outpatient)	127	61.1
Clinics and laboratories		
Viral load at the diagnosis: $\leq$ 100 thousand copies/mL	96	54.5
CD4+ T at HIV diagnosis		
$\geq$ 500 cells/mm <sup>3</sup>	36	20.5
201–499 cells/mm <sup>3</sup>	47	26.7
$\leq$ 200 cells/mm <sup>3</sup>	93	52.8
CD4+ T at first consultation		
$\geq$ 500 cells/mm <sup>3</sup>	40	20.3
201–499 cells/mm <sup>3</sup>	62	29.2
$\leq$ 200 cells/mm <sup>3</sup>	101	50.5
Clinical condition at first consultation <sup>a</sup> : no aids (Categories A/B)	117	56.2
Comorbidity <sup>b</sup> (at least one)	70	33.7
Metabolic diseases <sup>c</sup> (at least one)	43	20.7
Coinfection <sup>d</sup> (at least one)	141	67.8
Tuberculosis	14	6.7
Visceral Leishmaniasis	7	3.8
Others	119	57.2
STI (yes)	29	13.9
Psychiatric diagnosis <sup>e</sup> (at least one)	42	20.2

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Table 1. Continuation.

Characteristics	n*	%
Behavioral lifestyle		
Use of alcohol in life (yes)	105	59.7
Use of tobacco in life (yes)	149	82.8
Use of marijuana in life (yes)	52	30.8
Use of cocaine in life (yes)	50	30.1
Use of crack in life (yes)	29	17.4
Use of other illicit drugs in life <sup>f</sup> (yes)	21	12.5

\*Total varies due to ignored data; CD4+ T: CD4+ T lymphocytes; <sup>a</sup>Classification for HIV/CDC diseases (category A, category B and category C) at the first visits; <sup>b</sup>comorbidities registered at the first visit (immunological diseases, cancer and metabolic diseases); <sup>c</sup>diagnosis at the first consultation of diabetes, hypertension, dyslipidemia, hyperglyceridemia, hypothyroidism; <sup>d</sup>infectious diseases recorded at the first visit and those registered at the hospital and collected from medical records; STI: sexually transmitted infections; <sup>e</sup>diagnosis of mental disorders grouped into severe and non-severe at the first visit; <sup>f</sup>ecstasy, amphetamines, LSD, injectable drugs.

dementia, among others. Regarding lifestyle habits, almost 60% of patients reported at the first consultation that they currently consumed alcohol or consumed alcohol at some point in their lives, 82.8% currently smoked tobacco or smoked tobacco at some point in their lives, 43.1% used or have used at least one illicit drug, with marijuana being the most frequent one (30.8%) (Table 1).

Mostly, individuals were linked to the service within 90 days (timely care linkage) after the diagnosis of HIV. The average care linkage time was 138 days, with SD = 397.9, median equal to 37, ranging from 0 to 3,108 days. In the univariate analysis, the variables being 48 years old or older, having more than eight years of schooling, being married or living in a stable union, and having ever used cocaine during life were modeled in the multivariate analysis ( $p < 0.20$ ). The variables work and present CD4+ T count  $\leq 200$  cells/mm<sup>3</sup> were significantly associated in the univariate analysis ( $p < 0.05$ ) (Table 2).

In the multivariate analysis, the variables that remained in the final model (Table 2), considering  $p$  value  $< 0.05$ , were 48 years old or older (OR = 8.50; 95%CI 1.53 – 47.28); currently working (OR = 3.69; 95%CI 1.33 – 10.25) and present CD4+ T count  $\leq 200$  cells/mm<sup>3</sup> at diagnosis (OR = 4.84; 95%CI 1.54 – 15.18). The Hosmer-Lemeshow test presented  $\chi^2 = 3.407$ , degree of freedom (DF) = 7,  $p = 0.845$ .

## DISCUSSION

It was observed in this study that the average linkage time was 138 days and that delays of a few months or more between the diagnosis of HIV infection and first care may be

Table 2. Univariate analysis of factors associated with timely care linkage ( $\leq 90$  days) to a referral service for treatment of human immunodeficiency virus (HIV), Belo Horizonte, Minas Gerais, 2015 (n = 208).

Variables	Timely care linkage	Univariate analysis		Multivariate analysis	
	$\leq 90$ days	OR (95%CI)	p	OR (95%CI)	p
	n (%)				
Sociodemographic					
Gender					
Male	36 (78.3)	0.91 (0.41 – 1.99)	0.807	---	---
Female	124 (76.5)	1			
Age (years)					
$\geq 48$	41 (87.2)	2.67 (0.95 – 7.49)	0.063	8.50 (1.53 – 47.28)	0.014*
31–47	78 (75.0)	1.17 (0.56 – 2.43)	0.672	1.74 (0.65 – 4.62)	0.268
18–30	41 (71.9)	1			
Education (years)					
$> 8$	66 (73.3)	0.58 (0.28 – 1.18)	0.131	---	---
$\leq 8$	76 (82.6)	1			
Color					
White	37 (75.5)	0.91 (0.43 – 1.93)	0.805	---	---
Black/Brown	122 (77.2)	1			
Marital status					
Married/Stable union	50 (84.7)	1.94 (0.87 – 4.31)	0.101	---	---
Single/Widowed /Separated	109 (74.1)	1			
Children					
Yes	75 (80.6)	1.57 (0.78 – 3.17)	0.206	---	---
No	61 (72.6)	1			
Place of residence					
Belo Horizonte	111 (76.0)	0.84 (0.41 – 1.73)	0.638	---	---
Does not live in Belo Horizonte	49 (79.0)	1			

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Table 2. Continuation.

Variables	Timely care linkage	Univariate analysis		Multivariate analysis	
	≤ 90 days	OR (95%CI)	p	OR (95%CI)	p
	n (%)				
Working					
Yes	82 (83.7)	2.05 (1.02 – 4.14)	0.043	3.69 (1.33 – 10.25)	0.043*
No	65 (71.4)	1			
Health Service					
Entry route					
Outpatient	99 (78.0)	1.15 (0.60 – 2.23)	0.659	---	---
Hospitalization	61 (75.3)	1			
Clinical and laboratorial					
Viral load HIV diagnosis					
≤ 100 thousand copies/mL	62 (77.5)	1.28(0.64-2.55)	0.484	---	---
> 101 thousand copies /mL	70 (72.9)	1			
CD4+ T HIV diagnosis					
≤ 200 cells/mm <sup>3</sup>	77 (82.8)	3.01 (1.30 – 7.24)	0.011	4.84 (1.54 – 15.18)	0.007*
200–499 cells/mm <sup>3</sup>	32 (68.1)	1.36 (0.55 – 3.37)	0.510	2.53 (0.72 – 8.82)	0.148
≥ 500 cells/mm <sup>3</sup>	22 (61.1)	1			
CD4+ T at first consultation					
≤ 200 cells/mm <sup>3</sup>	79 (77.5)	1.25 (0.54 – 2.89)	0.587	---	---
200–499 cells/mm <sup>3</sup>	46 (78.0)	1.29 (0.51 – 3.27)	0.581	---	---
≥ 500 cells/mm <sup>3</sup>	30 (73.2)	1			
Clinical condition at first consultation					
With aids (Category C)	71 (78.0)	1.12 (0.57 – 2.30)	0.740	---	---
No aids (Categories A/B)	89 (76.1)	1			
Comorbidities					
Yes	55 (78.6)	1.15 (0.58 – 2.30)	0.688	---	---
No	105 (76.1)	1			

Continue...

Table 2. Continuation.

Variables	Timely care linkage	Univariate analysis		Multivariate analysis	
	≤ 90 days	OR (95%CI)	p	OR (95%CI)	p
	n (%)				
<b>Metabolic diseases</b>					
Yes	34 (79.1)	1.17 (0.51 – 2.64)	0.708	---	---
No	126 (76.4)	1			
<b>Coinfection</b>					
Yes	107 (75.9)	0.83 (0.41 – 1.68)	0.607	---	---
No	53 (79.1)	1			
<b>Psychiatric diagnosis</b>					
Yes	33 (78.6)	1.09 (0.58 – 2.08)	0.777	---	---
No	127 (76.5)	1			
<b>Life habits</b>					
<b>Use of alcohol (in life)</b>					
Yes	79 (75.2)	0.96 (0.47 – 1.93)	0.901	---	---
No	54 (76.1)	1			
<b>Tobacco smoking</b>					
Yes	113 (75.8)	1.09 (0.45 – 2.65)	0.846	---	---
No	23 (74.2)	1			
<b>Use of marijuana (in life)</b>					
Yes	38 (73.1)	0.78 (0.36 – 1.64)	0.507	---	---
No	91 (77.8)	1			
<b>Use of cocaine (in life)</b>					
Yes	35 (70.0)	0.61 (0.28 – 1.29)	0.194	---	---
No	92 (79.3)	1			
<b>Use of crack (in life)</b>					
Yes	20 (69.0)	0.62 (0.25 – 1.45)	0.282	---	---
No	108 (78.3)	1			
<b>Use of other illicit drugs (in life)</b>					
Yes	16 (76.2)	1.00 (0.34 – 2.93)	1.000	---	---
No	112 (76.2)	1			

OR: odds ratio; 95% CI: 95% confidence interval; LT: lymphocytes; \* multivariate analysis: Hosmer-Lemeshow test:  $X^2 = 3.407$ , degree of freedom (DF) = 7,  $p = 0.845$ .

common<sup>24</sup>. In addition, delayed linkage may be preceded by a delay between HIV infection and diagnosis, and most people are tested only after the development of AIDS symptoms<sup>25</sup>. Authors describe that delayed linkage is associated with advanced immune suppression, which leads to worse health outcomes for individuals<sup>24-26</sup>.

On the other hand, more than two-thirds of people joined the service 90 days or less after the diagnosis of HIV (timely care linkage), a result similar to that of high-income countries<sup>12,27,28</sup>. A study that included a meta-analysis from 1995 to 2009 found that 69% of people diagnosed with HIV in the United States were on time for treatment, and 72% were on treatment in less than four months<sup>29</sup>. In a 2011 systematic review including 10 studies conducted in sub-Saharan Africa, it was found that the average proportion of 59%<sup>9</sup> of PLHIV had been linked to health care in two or three months. There is evidence that more timely linkage is associated to longer survival<sup>30</sup>.

However, in the present study, it was found that among the patients who were timely linked, the majority (78%) had AIDS-defining conditions (categories A3, B3, C1, C2, C3), similarly to other studies in the literature<sup>30-34</sup>. That is, there was a late search for health services<sup>30,33</sup>.

In the final model, having a CD4+ T cell count  $\leq 200$  cells/mm<sup>3</sup> was positively associated with timely care linkage ( $\leq 90$  days), i.e., people with a worse immune system are linked earlier. This finding is corroborated by other studies that point out that starting health care late is previously associated with a higher CD4+ T count<sup>32,35</sup>. In addition, other researches show that self-perception of not feeling sick is associated with later linkage<sup>26,36</sup>. Also, patients with low CD4+ T counts, especially less than 100 cells/mm<sup>3</sup>, are at higher risk for polypharmacy, opportunistic infections, and other HIV-related complications<sup>31,34,37,38</sup>. Despite the benefit of ART, it is emphasized that these patients take longer to achieve good immune reconstitution than those who are linked with higher CD4+ T counts<sup>6,7</sup> and that they are more susceptible to morbidity and risk of life.

Age was also positively associated with timely care linkage ( $\leq 90$  days), showing that the likelihood of attachment increases with age. Similar studies have shown that adolescents and young adults (15–29 years) are less likely to be diagnosed and linked to care once diagnosed. Little knowledge and negative attitudes and beliefs about HIV infection at this age would explain the higher incidence of HIV in these individuals. Other studies also highlight the need for specific interventions aimed at young people and adolescents, such as the use of social marketing and the media (mobile and internet) to increase adherence to health care<sup>35,40,43</sup>.

Working patients were more likely to be linked to ongoing HIV care, as shown here. This result is in line with another study in which unemployed patients were more likely to lose themselves in the cascade of care, showing difficulty in being linked even before ART started<sup>33</sup>.

The diversity of factors involved in the health care of these patients makes the task of health professionals very complex and of great responsibility. Once the factors associated

with non-timely or late linkage are known, it is possible to propose measures for increased linkage, adherence to consultations, treatment follow-up, and ART.

Monitoring the entire cascade of continuous care and especially the assessment of the early stages, linkage and retention are necessary, as they are important indicators of quality of care and process measures, thus serving as a monitoring tool to identify failures and opportunities for interventions<sup>44</sup>.

In 2014, the United Nations Joint Program on HIV / AIDS (UNAIDS) announced a continuous search target 90-90-90 to control the HIV epidemic, which states that by 2020 90% of PLHIV should be aware of their status, 90% should be under treatment, and 90% should have undetectable VL<sup>45</sup>. This goal is in line with the concept of cascading care, which aims to provide benefits to individuals already infected with HIV, as well as a public health perspective, since the increase in people with viral suppression reduces the transmission of the disease.

As a critical evaluation of this study, the difficulties of analyzing secondary source data (clinical records) are pointed out, as well as the fact that it is a referral hospital service (SOS), which may include selection bias, making it difficult to generalize the results. In Belo Horizonte, there are three referral services that attend 98.0% of PLHIV, two outpatient services, and one hospital, and the SOS of the referred hospital accounts for about one-third of patient care, with 29.8% of attendances to patients from municipalities of the state of Minas Gerais.

## CONCLUSION

Our results reiterate the importance of ongoing and timely care for PLHIV, especially for young adults, with counseling and follow-up. A better understanding of HIV-related health-seeking behavior by the population is important for the design of more effective HIV care strategies.

It is necessary to strengthen strategic actions, such as the implementation of a rapid test for HIV, syphilis, and hepatitis in the basic units of Belo Horizonte, investment in research and discussions with SOS professionals about the need for timely care linkage, as well as monitoring of individuals in the cascade of continuous HIV care.

It is noteworthy that, respecting the limits of the study, the results obtained may contribute to the development of approaches to avoid untimely attachment not only in this SOS but in other specialized HIV care services.

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