

# Prevalence of VIH-1/HTLV-1 co-infection and behavioral risk among people living with hiv in Belo Horizonte, Brazil

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## ABSTRACT

**Objective:** To analyze the prevalence of HIV-1 and HTLV-1 co-infection and risk behavioral for sexually transmitted infections (STIs) and the quality of life among people living with HIV-1 (PL-HIV-1). **Methods:** 985 PL-HIV-1 in Belo Horizonte (Brazil) underwent serologic immunoassay screening for HTLV-1. Fifteen people confirmed (Western blot) for HIV-1/HTLV-1 co-infection (HIV-1/HTLV-1 group) were then compared to 30 HIV-1 (HIV-1 group) and 30 HTLV-1 (HTLV-1 group) patients, matched groups for biological sex and age, and was analyzed the sociodemographic status/quality of life and risk/behavioral factors for STIs. **Results:** The prevalence of HIV-1/HTLV-1 co-infection was 1.5%. The average age of the three groups was 57 ( $\pm$  11) years old, with 9 and 18 (60%) women within the HIV-1/HTLV-1 and HIV-1 or HTLV-1 groups, respectively. Heterosexual orientation predominated within the three groups. The HIV-1/HTLV-1 and HIV-1 groups had most no fixed partner ( $p = 0.013$ ), were single ( $p = 0.001$ ) and referred condom use ( $p = 0.025$ ). Most the HTLV-1 group had fixed partner, were married, and did not use condom ( $p = 0.025$ ). Among other STIs, syphilis was common within the HIV-1/HTLV-1 (34%) and HIV-1 (17%) groups, and gonorrhea (13%) within the HTLV-1 group. Intravenous drug use (IDU) in the HIV-1 group was associated with co-infection ( $p = 0.038$ ), and the quality of life differed among the groups. **Conclusions:** HIV-1 and HIV-1/HTLV-1 groups had different risk behaviors than HTLV-1 group. The measures to prevent the spread of HIV-1 and HTLV-1 should also highlight IDU in PL-HIV-1 and condom use in people living with HTLV-1.

**Keywords:** HTLV-1; HIV-1; coinfection; behavior (source: MeSH, NLM).

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## Prevalencia de coinfección VIH-1/HTLV-1 y comportamientos de riesgo de personas que viven con vih en Belo Horizonte, Brasil.

## RESUMEN

**Objetivo:** Analizar la prevalencia de coinfección de VIH-1 y HTLV-1 y comportamientos de riesgo para enfermedades de transmisión sexual (ETS) y la calidad de vida en personas que viven con VIH-1. **Métodos:** Se hicieron inmunoensayos serológicos para HTLV-1 a 985 personas que viven con VIH-1 en Belo Horizonte (Brasil). En 15 personas se confirmó (electrotransferencia) coinfección de VIH-1/HTVL-1 (grupo VIH-1/HTVL-1) y luego se los comparó con 30 pacientes VIH-1 (grupo VIH-1) y 30 pacientes HTLV-1 (grupo HTLV-

1), se combinaron grupos por sexo biológico y edad, y se analizaron las condiciones sociodemográficas, la calidad de vida y los comportamientos de riesgo para ETS. Resultados: La prevalencia de coinfección de VIH-1/HTLV-1 fue de 1.5%. La edad promedio de estos tres grupos fue 57 ( $\pm$  11) años, con 9 y 18 (60%) mujeres dentro de los grupos VIH-1/HTVL-1, y VHI-1 o HTVL-1, respectivamente. En los tres grupos predominó la orientación heterosexual.

Los grupos VIH-1/HTVL-1, y VHI-1 en su mayoría no tenían pareja estable ( $p = 0,013$ ), eran solteros/as ( $p = 0,001$ ) e indicaron uso de preservativo ( $p = 0,025$ ). La mayoría del grupo HTLV-1 tenían pareja estable, eran casados/as y no utilizaban preservativo ( $p = 0,025$ ).

Entre las ETS, la sífilis fue común en los grupos VIH-1/HTVL-1 (34%), y VHI-1 (17%), y la gonorrea (13%) en el grupo HTLV-1. El uso de drogas inyectables (UDI) en el grupo VIH-1 se asoció con coinfección ( $p = 0,038$ ) y se observaron diferencias en la calidad de vida en los distintos grupos. Conclusiones: Los grupos VIH-1 y VIH-1/HTLV-1 presentaron diferentes comportamientos de riesgo que el grupo HTLV-1. Las medidas para prevenir el contagio de VIH-1 y HTLV-1 también deben recalcar el UDI en personas que viven con VIH-1 y el uso de preservativos en personas con HTLV-1.

**Palabras clave:** HTLV-1; VIH-1; coinfección; comportamiento (fuente: MeSH, NLM).

## INTRODUCTION

**A**lthough the incidence of infectious disease caused by the human T-cell lymphotropic virus type I (HTLV-1) has been increasing throughout the world since the early 1980s, the infection patterns and main consequences are still neglected (1-3). HTLV-1 is a medium-sized virus particle (80–120 nm) belonging to the *Retroviridae* family. This virus has a predominantly tropism for CD4+ T-lymphocytes and causes a wide array of clinical outcomes with an associated target complexity within the human host, chronically and systematically affecting the central nervous system, blood, lungs, eyes, muscles, bladder, and skin, being the causative agent of adult T-cell leukemia/lymphoma and tropical spastic paraparesis/HTLV-1 associated myelopathy, uveitis and infective dermatitis (3,4).

Currently, most of the epidemiological data and clinical aspects associated with HTLV-1 come from Japan, Africa, The Caribbean Islands and Central and South America, which are the areas with the highest HIV-1 prevalence in the world. Globally, the geographical distribution of HTLV-1 infection is characterized by its occurrence into areas of high prevalence circumvented by less prevalence. Regions with more than 5% seropositivity for HTLV-1 are considered high-prevalence areas; average prevalence are those ones between 5% and 1%; and less than 1% are areas of low prevalence (1,2).

Brazil has more than 211 million inhabitants with ~2.5 million people living with HTLV-1, a prevalence in the general population estimated at ~1-1.2%. This country is an endemic area for HTLV-1 infection

and the largest contingent in absolute numbers in the world, besides the real number may be higher, due to the large number of HTLV-1-infected people who are asymptomatic (1,5). In blood donors (BD), the cumulative HTLV-1 prevalence in Brazil is close to 0.5%, with the highest rates in the north and northeast and the lowest in the southern region (5). Minas Gerais (MG) is a Brazilian State with a prevalence of HTLV-1 infection of ~0.32%, while in BD it is 0.66% (5).

Human acquired immunodeficiency syndrome (AIDS) still stands out among the emerging infectious diseases by its great magnitude and extent. Regions with prevalence lower than 5% of human immunodeficiency virus-1 (HIV-1) infection are considered emerging epidemics or low level. If the prevalence is greater than 5%, it is set as concentrated epidemic when one or more subpopulations have high-risk behavior and the epidemic is considered widespread when the infection is no longer restricted to risk behavior subpopulations with high prevalence infection rates throughout the country (6). The widespread epidemic occurs in sub-Saharan Africa and Haiti and low-level epidemic in countries like Algeria, Chile, Costa Rica, Cuba, Suriname, Russian Federation and Poland (5). The epidemic in Brazil is classified as concentrated, like some countries in South America, Sudan, Thailand, and Ethiopia (6,7). In Brazil, ~1 million people are estimated to be living with HIV-1, a prevalence in general population of ~0.35-0.5%, but variations among population groups are associated with risk factors and other behaviors in which the spread of HIV-1 accelerate

reaching high rates among men-who-have-sex-with-men (MSM, ~12%), female sex workers (~6%) and injection drug users (DU, ~5%); thus, in this country HIV-1 infection remains endemic at certain levels with critical prevalence rates in subpopulations due to risk and behavioral factors (7).

Over the decades, co-infection is a major public health problem among people living with HIV-1, as seen in cases of HIV-1 and Tuberculosis (HIV-1/TB) co-infection (8). Besides, co-infection of HIV-1 and HTLV-1 has shown increasing incidence, especially in countries of South America and Africa (9). People living with HIV-1/HTLV-1 co-infection are more susceptible to develop myelopathies and neurological disease and have an overall impairment in health status with increased morbidity and mortality rates (10). In Brazil, there are cities considered to have high-prevalence of HIV-1/HTLV-1 co-infection, covering up to 21.1% within HIV-1 population and varying by region (4,9-11). Possibly, there is a correlation in the geographical distribution of both infections/infectious diseases. However, public health policies fail to critically consider the

risk factors for HTLV-1 transmission, in addition to the geographic distribution.

Although both HTLV-1 and HIV-1 share common transmission routes, the mother-to-child-transmission (MTCT) and predominantly through breastfeeding is most frequent for HTLV-1 (12), whereas sexual intercourse (SI) is most common for HIV-1 (13). Furthermore, HTLV-1 alternates between persistence and productive cycles during infection, which favors an effective mechanism to boost vertical (MTCT) and horizontal transmissions [SI, blood transfusion (BT) and intravenous drug use (IDU)] (3,12). Prevention programs have been active to fight the dissemination of HIV-1/AIDS in Brazil and it is understood they could also extend for HTLV-1 prevention. However, to date, is still unknown the impact of health prevention policies towards HIV-1 to extensively prevent risk behavior in patients with HTLV-1. In that way, we analyzed the prevalence of HIV-1/HTLV-1 co-infection in HIV-1 patients in Belo Horizonte (BH), Brazil, and the risk and behavioral factors and quality of life among them.

## MATERIALS AND METHODS

The study was approved by the Institutional Review Boards of the participating institutions: Eduardo de Menezes Hospital (approved protocol No. 168/10), Hemominas Foundation (approved protocol No. 286) and referred to UFMG's Institutional Review Board; along the lines of the ethical standards from the Helsinki Declaration. The present study involving human subjects was only possible after obtaining an individual informed consent.

This is a cross-sectional study, analyzing HTLV-1 prevalence in people living with HIV-1. In a first phase, plasma samples from these patients were screened for HTLV-1. Then, from this population, those patients confirmed as co-infected were analyzed regarding the risk factors for communicable diseases (CD) transmitted vertically (MTCT) or horizontally by SI or blood (BT and IDU), comparing with matched groups of HIV-1 (HIV-1 group) or HTLV-1 patients (HTLV-1 group), to compose three groups. The study was attended by people living with HIV-1 who were receiving outpatient care and regular care at the Eduardo de Menezes Hospital in BH, a Reference Center for Infectious Diseases of the State of Minas Gerais (MG), from May 2012 to December 2015. In 2012, this hospital had ~2000 patients with HIV-1 registered in the medical clinic. Currently,

the MG state's total population size is ~21 million inhabitants<sup>2</sup>, with a density of ~33 inhabitants per km<sup>2</sup>. Its capital city, BH, has a population of ~2.5 million inhabitants, with a density of 7167 inhabitants per km<sup>2</sup>.

Co-infected HIV-1/HTLV-1 people (HIV-1/HTLV-1 group) were selected from this population. For each diagnosed case of co-infection, were selected two individuals as controls of HIV-1 and HTLV-1 patients, matched by gender and age, registered in the Eduardo de Menezes Hospital database and in the Interdisciplinary Group database Research in HTLV (GIPH) (14). Individuals aged 18 years, or more were included, and the selection of subjects into the HIV-1 and HTLV-1 groups took place after confirmation of HIV-1/HTLV-1-CI. At the beginning, people living with HIV-1 were tested for HTLV-1 through serologic enzyme immunoassay (EIA) screening, and the positive cases confirmed by Western blot.

Then, data from the three groups were obtained through a structured questionnaire formulated by the researchers and applied in similar studies, validated in several studies on sociodemographic, quality of life and risk behavior for CD (references from 15 to 19) (15-19). Interviewers were previously calibrated

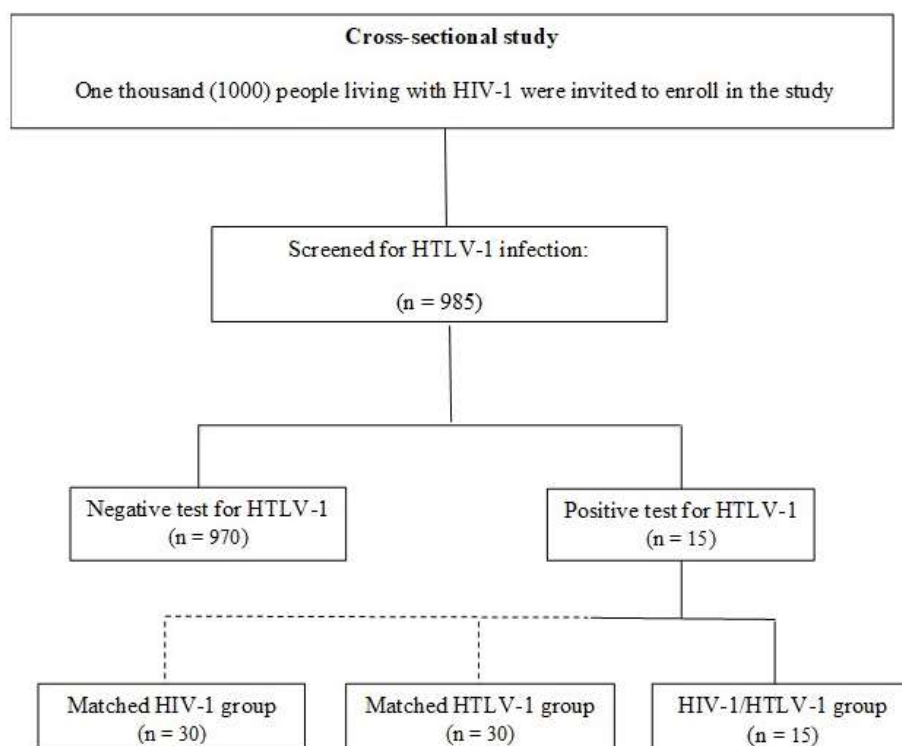
(kappa statistic over the 90%). The presence of bias was emphasized, and recall periods were dependent on the variables. Moreover, the following criteria were adopted: N° partners according to the World Health Organization (WHO) – multiple (2 or more per year) (7); Interviewees breastfed by mother – Yes or No; Condom use – No (Never) or Yes (Regular: always; Irregular: sometimes) (7); and IDU and BT – Yes or No. Next, the collected data were entered into the database built in a statistical software (SPSS

version 16.0) and processed by means of descriptive statistics, with percentage calculations, average, median, frequencies and 95% confidence interval (95% CI). Statistical comparisons were made by analysis of variance (ANOVA), T test, Kruskal-Wallis test, Mann-Whitney test, or Fisher’s exact test, with  $p < 0.05$  significant, unless otherwise specified. The Good Clinical Practice Guidelines, Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), was adopted.

## RESULTS

From the 1000 subjects attending Eduardo de Menezes Hospital, invited to perform serology for HTLV-1, 985 were tested (summarized in Figure 1). HIV-1/HTLV-1 co-infection was confirmed in 15 people living with HIV-1, with a prevalence at 1.5% (Table 1). Then, these fifteen patients with confirmed HIV-1/HTLV-1 co-infection (HIV-1/HTLV-1 group) were compared with 30 HIV-1 (HIV-1 group) and 30 HTLV-1 (HTLV-1 group) patients (summarized

in Figure 1). The average age of the three groups was 57 ( $\pm 11$ ) years old, with 9 and 18 (60%) women in the HIV-1/HTLV-1 group and HIV-1 or HTLV-1 groups, respectively (Table 1). Furthermore, the sociodemographic characteristics for the three groups are shown in Table 1. The results indicate that the groups were different in relation to marital status, and the percentage of married participants was significantly higher in HTLV-1 group.



**Figure 1:** STROBE diagram for stages of analysis in the sample of people living with HIV-1 in Belo Horizonte, Brazil

Regarding the risk factors, Table 2 shows the percentage of participants with possible risk behavior for CD, including other sexually transmitted

infections (STIs). The data indicate that the HTLV-1 group had a significantly higher percentage of people who have a steady partner than other groups.

The sexual orientation varied between groups, but no difference was observed. Within the HTLV-1 group, 100% declare themselves heterosexual. IDU was mentioned only within the HIV-1/HTLV-1 group (13%). The percentage of STIs was different between the groups, and hepatitis B and C were just

observed in the HIV-1/HTLV-1 group, syphilis had higher prevalence in the HIV-1/HTLV-1 and HIV-1 groups, and gonorrhea predominated in the HTLV-1 group. The frequency of condom use was higher in the HIV-1 and HIV-1/HTLV-1 groups than HTLV-1 group ( $p = 0.025$ ).

**Table N° 1:** Prevalence of HIV-1/HTLV-1 co-infection and sociodemographic characteristics of HIV-1/HTLV-1-co-infected, HTLV-1 and HIV-1 patients, Belo Horizonte, Minas Gerais, Brazil, 2012-2015.

HIV-1/HTLV-1 co-infection	n = 985 (100)		95% CI		
Yes	15 (1.5)		0.8-2.3		
No	970 (98.5)		97.7-99.2		
HIV-1/HTLV-1 co-infection vs. HIV-1 or HTLV-1 groups					
Groups	HIV-1/HTLV-1 n = 15	HTLV-1 n = 30	HIV-1 n = 30	p-value	
<b>Age (years)</b>					
Age (current)	57.3 ± 10.5	57.4 ± 11.1	56.7 ± 10.6	0.933 *	
Age Dx. HIV	47.2 ± 11.3	-	47.3 ± 7.7	0.976 **	
Age Dx. HTLV	54.9 ± 10.1	49.1 ± 12.0	-	0.118**	
<b>Biological sex</b>					
Male	6 (40)	12 (40)	12 (40)	----	
Female	9 (60)	18 (60)	18 (60)		
<b>Education</b>					
Illiterate	0	0	1 (3)		
ES. Incomplete	10 (67)	19 (66)	16 (57)		
ES. Completed	2 (13)	2 (10)	2 (7)	0.317 ***	
HS. Completed	3 (20)	7 (23)	8 (27)		
COL. Completed	0	1 (3)	2 (7)		
<b>Status</b>					
Single	6 (40)	5 (17)	12 (40)	< 0.001***	
Married	2 (13)	15 (50)	5 (17)		
Widow	7 (47)	6 (20)	4 (13)		
Marital Status	0	0	7 (23)		
Stable Union	0	4 (13)	2 (7)		

**Caption:** Data were presented as means ± standard deviation, absolute number, and percentage (parentheses). Dx = Diagnosis; ES. = Elementary School; HS. = High School; COL. = College; \*Anova test; \*\* T test; \*\*\* Fisher's exact test.

Concerning the parameters of quality of life (Table 3), statistical relevance was observed between the HIV-1/HTLV-1 and HTLV-1 groups in the

psychological domain (negative feelings,  $p = 0.001$ ) and in the physical domain (medical dependence,  $p = 0.006$ ).

**Table N° 2:** Comparison of risk behavior and sexually transmitted infections (STIs) in HIV-1/HTLV-1-co-infected, HTLV-1 and HIV-1 patients, Belo Horizonte, Minas Gerais, Brazil, 2012-2015.

Groups	HIV-1/HTLV-1 co-infection vs. HIV-1 or HTLV-1 groups			p-value *
	HIV-1/HTLV-1 n = 15 (%)	HTLV-1 n = 30 (%)	HIV-1 n = 30 (%)	
<b>Steady partner</b>	3 (20)	21 (70)	14 (47)	<b>0.001</b>
<b>N° partners</b>				
No partner	8 (53)	9 (30)	14 (47)	
Only one	3 (20)	21 (70)	14 (47)	<b>0.001</b>
2 or more/year (multiple)	4 (27)	0	2 (6)	
<b>Sexual Orientation</b>				
Heterosexual	14 (93)	30 (100)	27 (90)	
Homosexual <sup>1</sup>	1 (7)	0	0	<b>0.049</b>
Bisexual	0	0	3 (10)	
<b>Breastfeeding</b>	10 (67)	20 (67)	19 (63)	1
<b>Risk behavior</b>				
Condom use	9 (60)	5 (17)	15 (50)	<b>0.025</b>
IDU	2 (13)	0	0	<b>0.016</b>
Blood transfusion	3 (20)	4 (13)	7 (23)	0.639
<b>Other STIs</b>				
Hepatitis B	2 (13)	0	0	<b>0.038</b>
Hepatitis C	2 (13)	0	0	<b>0.038</b>
Syphilis	5 (34)	1 (3)	5 (17)	<b>0.025</b>
Gonorrhea	0	4 (13)	1 (3)	<b>0.025</b>
Chlamydia	1(7)	0	0	0.132

**Caption:** <sup>1</sup>men who have sex with men; IDU = Intravenous drug use; Data were presented as absolute number and percentage (parentheses); \*Fisher's exact test.

**Table N° 3:** Comparison of life quality in HIV-1/HTLV-1, HTLV-1 and HIV-1 patients, Belo Horizonte, Minas Gerais, Brazil, 2012-2015.

Groups	HIV-1/HTLV-1 co-infection vs. HIV-1 or HTLV-1 groups			p-value *
	HIV-1/HTLV-1 n = 15	HTLV-1 n = 30	HIV-1 n = 30	
<b>Physical domain</b>	13.14 ± (1.14)	13.14 ± (1.71)	13.14 ± (1.71)	0.382*
Need for Medical care	15.96	25.55	----	<b>0.006**</b>
<b>Psychological domain</b>	13.3 ± (2.67)	14.0 ± (1.50)	14.0 ± (1.50)	0.545*
Negative feelings	14.07	26.43	----	<b>0.001**</b>
<b>Social relationships</b>	13.3 ± (1.3)	14.1 ± (3.0)	14.6 ± (2.67)	0.58*
<b>Environment relations</b>	13.0 ± (1.0)	13.5 ± (2.0)	13.0 ± (2.5)	0.747**

**Caption:** Data were presented as means ± standard deviation or percentage; \*Kruskal-wallis test; \*\*Mann-Whitney test; ----: Not available.

Table 4 shows the relationship between condom use and marital status in each group. Participants who reported not having sex were not considered in the analysis. The results indicate that the HTLV-1 group has a different behavior in relation to prevention, compared with the HIV-1/HTLV-1 and HIV-1 groups. HTLV-1 group proportionally has a lower

condom use, especially by those individuals who are married (or keep stable relationship). In contrast, within the HIV-1 group, most of patients single (Not married) use condoms regularly, and even the married ones. The prevention behavior in the HIV-1 and HIV-1/HTLV-1 groups were remarkably similar.

**Table N° 4:** Relationship between condom use and marital status of HIV-1/HTLV-1-co-infected, HTLV-1, and HIV-1 patients.

Groups		HIV-1/HTLV-1 <i>n</i> = 8	HTLV-1 <i>n</i> = 22	HIV-1 <i>n</i> = 18
Condom use		<i>n</i> (%)		
Marital Status				
<b>Married</b>	Yes/regular	2 (100)	2 (11)	6 (86)
	Yes/Irregular	0 (0)	5 (26)	0 (0)
	No	0 (0)	12 (63)	1 (14)
<b>Total</b>		2	19	7
<b>Not Married</b>	Yes/regular	4 (66)	2 (67)	5 (46)
	Yes/Irregular	1 (17)	1 (33)	2 (18)
	No	1 (17)	0 (0)	4 (36)
<b>Total</b>		6	3	11

**Caption:** According to the Fisher’s exact test, all of groups (HIV-1/HTLV-1, HTLV-1 and HIV-1) were significantly different from each other for married status ( $p < 0.05$ ), and within the HTLV-1 group, married was different than not married ( $p < 0.05$ ). People who keep/kept stable relationship were also considered as “Married”.

## DISCUSSION

In this study, the prevalence of HIV-1/HTLV-1 co-infection observed in a sample of people living with HIV-1 in Belo Horizonte (Brazil) was 1.5%, a percentage similar to those observed in Pernambuco and Piauí (10,20), higher than that observed in Southern Santa Catarina (21), but lower than those other reported in different regions of the country that can reach up to 21.1% (22-29), in studies conducted with similar methodology. The state of São Paulo has a lower general prevalence of HTLV-1, ~0.32% (5), but higher rates of co-infection: São Paulo, 5% (28), Santos 6.0% (29), and Ribeirão Preto 11% (29). In Ribeirao Preto, there is a greater number of DU compared to São Paulo or Santos (28,29), and this city has a population that is 16 times smaller

than São Paulo (28). Sharing needles and syringes is another important route of parenteral transmission for HTLV-1. In this study, IDU was the risk factor associated with co-infection. Thus, this prevalence does not appear to represent a geographic distribution in areas which is characteristic of high HTLV-1 infection rates, but it seems to have a distribution pattern associated with distinct regional endemicity, risk behavior, and varied routes of HTLV-1 exposure, which is also characteristic of HIV-1 (27).

The sexual behavior in the HTLV-1 group apparently showed to be safer when compared to the other two groups here analyzed, when referring to a steady partner. Indeed, the fact that they are former BD is associated with this behavior. Other studies have

already shown that patients with HTLV-1, even if not former BD, prefer stable relationships (18,30). The option for heterosexual relationships has also been previously shown (31). In the present study, the heterosexual behavior predominated in all three groups, indicating that infection with HIV-1, as well as HTLV-1, are not exclusively associated with MSM, but with a marked neglect of prevention measures. In a first analysis, the former BD living with HTLV-1 would not be maintaining a risk behavior to infect others, since they are accompanied and are part of a cohort in which the guidelines on prevention are routinely performed (14). However, the results of this study indicate that the actions of prevention were not sufficiently able to change the sexual behavior of patients with HTLV-1, since they did not use condoms in relationship with a steady partner and had concomitantly other STIs. Of note, the data found in this study, as well others previously described (21), are shedding light on the fact that the prevalence of HIV-1/HTLV-1 co-infection is higher in patients with HIV-1 who had other risk behaviors than individuals who were BD.

Furthermore, the sexual behavior of HIV-1/HTLV-1 group vs. HIV-1 group was different. Co-infected HIV-1/HTLV-1 patients had a steady partner less frequently and reported condom use on a regular basis, even when they were with a steady partner. The three groups were similar regarding education, with predominance of low education levels, showing that adherence to condom use in the HIV-1/HTLV-1 and HIV-1 groups is most probably motivated by other prevention strategies and not because of a better education. This set of information shows that people living with HIV-1 from the general population have a safer sexual behavior than former BD living with HTLV-1. The infectious disease caused by the HTLV-1 is considered by the Brazilian Ministry of Health as a “neglected disease” (32), consequently, specific health policies for HTLV-1 prevention have not yet been prioritized (2,3,32). Also, little is known by both the population and the health professionals about the HTLV-1 infection, despite the high number of patients living with HTLV-1 in Brazil. Most studies covering HTLV-1 prevalence in Brazil are based on population groups of risk (e.g., BD; DU, MTCT), being estimated that the real prevalence in the general population is much higher than officially reported<sup>5</sup>. Probably, because of that, the prevalence of HIV-1/HTLV-1 co-infection has increased (9).

Breastfeeding and BT were similar between the groups here analyzed. On the other hand,

IDU predominated in the HIV-1/HTLV-1 group. Corroborating the hypothesis of greater exposure to bloodborne pathogens by DU, only in the HIV-1/HTLV-1 group was observed hepatitis B or C. The highest risk for acquiring hepatitis B by HIV-1 and HTLV-1 patients has been previously demonstrated (19), and the highest prevalence rates of STIs in this group is already known (31). However, the relationship between HIV-1/HTLV-1 co-infection and HBV is still unclear, in part, due to a low prevalence of both infections simultaneously (31,33). HCV is associated with HTLV-1, especially in DU (19,34). These findings are consistent with the epidemiological profile observed in the present study, and they reinforce that sharing needles and syringes is a relevant route of parenteral transmission for HTLV-1 as well HBV/HCV. Thus, co-infected patients seem to be getting more infectious diseases by sharing needles and syringes than by unprotected SI. Among the STIs, syphilis was the most common in the HIV-1/HTLV-1 and HIV-1 groups, while gonorrhea predominated in the HTLV-1 group. Increased prevalence rate of gonorrhea in patients with HTLV-1 strengthens the sexual behavior risk among this group. Concerning the syphilis, our findings are in line with other publications reporting the recent increasing in syphilis in the general population (35,36). Currently, the recrudescence observed affects future generations because of a high rate of infections that progress to the tertiary stage without treatment and the severity of neonatal syphilis.

Regarding the quality of life, the HIV-1/HTLV-1 group had an average below compared to the HTLV-1 group in relation to medical dependence and negative feelings. It is well established that both HIV-1 and HTLV-1 infections and the infectious diseases caused by these viruses, compromise the patient's quality of life (16). The treatment routine seems to interfere with the daily life of HIV-1/HTLV-1 and HIV-1 patients, compromising the quality of life (16). Since these diseases lack definitive cures, the measurement of quality of life is essential for the evaluation of treatment strategies and the implementation of health programs enabling comprehensive care (15). Therefore, the co-infected patients depend more on medical and/or multidisciplinary assistance, as well as they have more exacerbated negative feelings.



## CONCLUSIONS

We observed that the HIV-1/HTLV-1 group was protected from the sexual point of view and significantly the main route for acquiring HIV-1/HTLV-1 co-infection was through the sharing of contaminated needles and syringes. The main limitation of this study was that our data do not allow to differentiate, among the co-infected patients, which of the two infections occurred first. Even so, the HIV-1/HTLV-1 co-infected and HIV-1 patients reported the practice of safe SI, even among married, which was different from the HTLV-1 patients who in most cases said not using condoms. A moderate rate of HIV-1/HTLV-1 co-infection in people living with HIV-1 in Belo Horizonte was observed (1.5%), being it higher than those seen in other risk groups, including MTCT and BD. This shows that patients with HIV-1 with certain behavioral risks should be targeted by specific health policies aimed at containing the spread of both HIV-1 and HTLV-1. Moreover, HIV-1 patients remained exposed to HTLV-1 and other STIs via IDU, a well-known risk factor for HIV-1 infection. Consequently, since there are these cultural and social differences that interfere with the risk of contagion, public health prevention measures should also consider injection drug users in people living with HIV-1 and condom use in people living with HTLV-1.

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