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Anogenital infection by *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in HIV-infected men and women in Salvador, Brazil

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ABSTRACT

Background: Infections caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae* are the most common bacterial sexually transmitted infections throughout the world. These sexually transmitted infections are a growing problem in people living with HIV/AIDS. However, the presence of these agents in extra genital sites, remains poorly studied in our country. The objective of this study was to estimate the prevalence of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* anal and genital infection in people living with HIV/AIDS followed in a reference center in Salvador, Brazil.

Methods: Cross-sectional study, from June 2013 to June 2015. Proven HIV-infected people attending this reference center were invited. Clinical and epidemiological data were obtained through interview with standardized form. *Chlamydia trachomatis* and *Neisseria gonorrhoeae* screening was performed using qPCR (COBAS 4800® Roche).

Results: The frequency of positive cases of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* was 12.3% in total, 9.2% cases amongst women and 17.1% amongst men. We found 14.0% of positive cases in anus and 3.1% in genital region in men, while 5.6% and 3.6%, in women, respectively. Among men, anal infection was associated with age <29 years ($p = 0.033$), report of anal intercourse ($p = 0.029$), pain during anal intercourse ($p = 0.028$). On the other hand, no association between genital infection and other variables were detected in bivariate analysis. Among women, we detected an association between *Chlamydia trachomatis* genital infection and age <29 years ($p < 0.001$), younger age at first sexual intercourse ($p = 0.048$), pregnancy ($p < 0.001$), viral load >50 copies/mL ($p = 0.020$), and no antiretroviral use ($p = 0.008$).

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Anal infection in women was associated with age <29 years old ($p < 0.001$) and pregnancy ($p = 0.023$), and was not associated with report of anal intercourse ($p = 0.485$).
Conclusion: Missed opportunities for diagnosis in extra genital sites could impact on HIV transmission. The extra genital sites need to be considered to break the HIV and bacterial sexually transmitted infections chain-of-transmission.

Introduction

Chlamydia trachomatis (CT) and *Neisseria gonorrhoeae* (NG) infections are the most common bacterial sexually transmitted infections (STI) throughout the world.[1] These infections may cause complications both in men and women, such as epididymitis, urethritis, cervicitis, pelvic inflammatory disease, and ectopic pregnancy.[1,2] STI in extragenital sites, such as anus, rectum, and pharynx, are an increasing cause for concern. Recent studies show increasing reports of anal intercourse amongst heterosexuals and lower rates of condom use in anal intercourse compared to vaginal intercourse.[3] Anorectal mucosa is vulnerable to HIV due to lack of appropriate protective humoral immune barrier and for being more susceptible to traumatic lesions then the vaginal mucosa.[4] In addition, possible biological, behavioral, and social factors, such as insufficient knowledge regarding anorectal STI risks and anal intercourse to please the partner also contribute to STI infection.[5] The low percentage of diagnostic screening in addition to inappropriate treatment maintain the bacterial STI chain-of-transmission, thus increasing STI and HIV transmission.[6]

The presence of CT and NG infection, especially in the anorectal region, is associated to the increased risk of HIV infection. In people living with HIV/AIDS (PLHA), CT and NG infections increase the genital HIV viral load (VL) and the possibility of sexual and vertical transmission of the virus.[7] Despite the raise of the HIV epidemics amongst men who have sex with men (MSM) highlight the role of unprotected anal intercourse on the HIV transmission, the role of this practice in the heterosexual HIV transmission is still poorly understood.

Although studies show anorectal prevalence for CT in women (6.6–9.3%) to be similar to that of MSM (6.5–10.1%) and the therapeutic recommendations for infections on this site possibly differ from those in the urogenital sites,[6,8,9] there is still no definition regarding the systematic investigation for CT and NG in extragenital sites in heterosexual women.

The aim of this study was to estimate the prevalence of anorectal and genital infection by *C. trachomatis* and *Neisseria gonorrhea* and the associated risk factors, such as lifestyle and sexual practices, in women and men living with HIV/AIDS receiving care in a reference center in Salvador, Brazil.

Material and methods

Patients and settings

This was a cross-sectional study conducted at Centro Especializado em Diagnóstico, Assistência e Pesquisa (CEDAP) from June 2013 to June 2015. CEDAP is the state reference center for STI and HIV in Salvador, Bahia, Northeast of Brazil, attending approximately 60% of PLHA in the state, with an average of 76 new cases of HIV/AIDS and 373 new cases of STI each month. The health center is staffed with infectious disease specialists, and other medical and paramedical professionals. Irrespective of their area of specialization physicians are trained to deliver care for patients with sexually transmitted diseases.

Confirmed HIV-infected patients undergoing treatment with the gynecologist and proctologist at the clinic were invited to participate in the study, regardless of their signs and symptoms of STI. Sexually active patients regardless of age were assessed. Patients who had used antibiotics 30 days before from the appointment, and women with genital bleeding at the exam were not included. Pregnant women with no recent obstetric complications were also included in this study.

Laboratory tests

The CT and NG screening was performed using qPCR in closed system – *In vitro Diagnostic* (IVD), COBAS 4800® Roche, using COBAS® PCR Media Female as transport for the endocervix and anorectal specimens, and COBAS® PCR Media Urine for male urine samples. The samples were collected according to the manufacturer instructions. The anorectal samples collection was adapted for COBAS® PCR Media Female, as it is not standardized for the IVD from COBAS 4800® Roche system. The anorectal samples were collected through the swab introduced 2–3 cm after anal margin and it was done in 360° turn; endocervix samples were collected by gynecologist during specular exam; and urine was collected by the patients in adequate recipients. The samples were collected during a medical appointment at CEDAP and were processed at the Professor Gonçalo Moniz Central Laboratory of Public Health of Bahia – LACEN-BA.

All patients had a blood sample drawn to assess HIV viral load and TCD4+/TCD8+ cells count at the time of the appointment. Lymphocyte TCD4+/TCD8+ count was performed by flow cytometry (Facscalibur, Becton and Dickinson, California, USA) and HIV viral load was quantified using PCR Real time (Abbot molecular, Illinois, USA)

Data collection

Socio-demographic, behavioral, and clinical data were obtained through standardized medical interview. Patients were scheduled further medical appointment one month after sample collection for delivering tests results and

prescribing treatment of the identified infections. All patients signed a written informed consent. This study was approved by the Ethics Committee of the Maternidade Climério de Oliveira/Universidade Federal da Bahia (process 292,413).

Statistical analyses

Data analysis were performed using SPSS 20.0 (SPSS Inc, Chicago, IL, USA). Chi-square test was used for univariate analysis of categorical variables like ethnicity (white × non-white), marital status (single × married/stable union), schooling (≤8 years of study × >8 years of study), alcohol intake, tobacco and drug use (yes × no). Continuous variables such as age, age at first intercourse, number of partners, and time since HIV diagnosis were analyzed by Student's *t* test. *p*-values lower than 0.05 were considered statistically significant; 95% confidence intervals (CI) were calculated for means and proportions. Variables with $p \leq 0.20$ in univariate analysis were included in the logistic regression backward stepwise model for multivariate analysis. For women, the variables in the regression were: age, schooling, pregnancy, alcohol use, drugs use, pelvic pain, cervicitis, genital discharge, alcohol before sex, anal receptive intercourse, HAART use, HIV viral load. For men, those who referred no anal receptive intercourse were excluded from the logistic regression analysis because they did not have CT or NG anal infection. Therefore, the variables analyzed were: age, ethnicity, alcohol before sex, pain in anal intercourse, genital ulcer and painful anorectal exam.

Results

A total of 521 PLHA, 208 men and 313 women were evaluated. Of those, 15 (2.9%) men who did not collect a urine sample and eight (2.6%) women who had inadequate anorectal samples were excluded. There was no statistically significant difference between the enrolled and excluded patients.

The final sample comprised 305 women and 193 men. The overall prevalence of any CT or NG infection was 12.3% (61/498), 9.2% (28/305) cases amongst women and 17.1% (33/193) amongst men. The overall mean age was 37.0 years (±10.5), 10.4% (52/498) self-reported to be white, 38.6% (192/498) were married or in a common-law marriage, and 73.5% (366/498) had more than eight years of regular education. A total of 83.1% (414/498) were on antiretroviral therapy, but 37.0% (165/446) had viral load above 40 copies/mL.

Some significant differences between genders were found in this study sample. Men were younger, mostly single, with higher education and family income. Alcohol, tobacco and drug use were more frequently declared by men, as well as higher number of sexual partners, receptive anal sex, and history of STI, as seen on Table 1.

Amongst women, there were seven cases of combined CT infection (endocervix and anus). Two men (6.1%) had both anorectal and urine positive for NG infection, and one (3.0%) for CT infection in both sites. Regarding the investigated site, there were 14.0% (27/193) of positive cases in anus and 3.1% (6/193) in genital region in men, while 5.6% (17/305) and 3.6% (11/305) cases in women, respectively (Table 2).

Clinical, behavioral, and epidemiological aspects associated with the presence of CT and NG infection in genital and anorectal areas in men and women are described in Table 3. Among men, anorectal infection was associated with age <29 years ($p = 0.033$), report of anal intercourse ($p = 0.029$), pain during anal intercourse ($p = 0.028$), and painful anorectal exam ($p = 0.022$). Only men who referred anal intercourse have CT and NG anal infection. After logistic regression, the variables that remained significantly associated with anorectal infection were painful anorectal exam ($p = 0.014$, OR-3.59, 95% CI 1.29–9.95), and white ethnicity ($p = 0.018$, OR-3.85, 95% CI

Table 1 – Clinical and socio-demographic characteristics of 498 people living with HIV/AIDS, in Salvador, Brazil, according to gender.

Characteristics	Men (*n* = 193)	Women (*n* = 305)	*p*-Value
Age (years), mean (SD)	35.8 (9.9)	37.7 (10.8)	0.042
Age at sexual debut (years), mean (SD)	14.9 (3.4)	16.4 (3.5)	<0.001
Lifetime number of sexual partners, median (IQR)	30 (12–200)	5 (3–10)	<0.001
White race, *n* (%)	30 (15.5)	22 (7.2)	0.003
Married/cohabitating Marital status, *n* (%)	46 (23.8)	159 (52.1)	<0.001
Educational level ≥8 years, *n* (%)	170 (88.1)	196 (64.3)	<0.001
Monthly household income ≤2 minimum wages, *n* (%)[a]	102 (53.4)	252 (82.6)	<0.001
Alcohol use, *n* (%)	144 (74.6)	166 (54.4)	<0.001
Tobacco use, *n* (%)	42 (21.9)	29 (9.6)	<0.001
Drug use, *n* (%)	52 (26.9)	43 (14.1)	<0.001
Alcohol use before sex, *n* (%)	91 (47.2)	123 (40.9)	0.169
Drug use before sex, *n* (%)	32 (16.6)	23 (7.5)	0.002
Transactional sex, *n* (%)	19 (9.8)	28 (9.2)	0.805
Anal receptive intercourse, *n* (%)	167 (86.5)	191 (62.6)	<0.001
Previous STI, *n* (%)	167 (86.5)	151 (49.5)	<0.001
Time from HIV diagnosis (months, median (IQR)	42.5 (10.5–121.7)	85.2 (32.8–136.8)	<0.001
ART in use, *n* (%)	159 (82.4)	255 (83.6)	0.722
Duration on ART (days), median (IQR)	24.3 (2.0–82.6)	48.7 (3.0–121.7)	0.004

STI, sexually transmitted infections.
The numbers do not always add up the total because of missing values.
[a] Minimum wage ≈$194.

Table 2 – Prevalence of *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG) in 498 people living with HIV/AIDS, in Salvador, Brazil.

	Chlamydia trachomatis n/N (%)	*Neisseria gonorrhoeae* n/N (%)	Total[a] n/N (%)
Male			
Anus	18/193 (9.3)	11/193 (5.7)	27/193 (14.0)
Urine	3/193 (1.6)	3/193 (1.6)	6/193 (3.1)
Female			
Anus	16/305 (5.3)	2/305 (0.7)	17/305 (5.6)
Endocervix	11/305 (3.6)	0/305 (0.0)	11/305 (3.6)

[a] Excluded co-infections.

1.26–11.77). On the other hand, no association between genital infection and other variables were detected in univariate analysis. After logistic regression, only lifetime sexual partners >3 ($p = 0.019$, OR-22.41, 95% CI 1.67–305.94) was independently associated with genital infection.

Among women, there was an association between CT genital infection and age less than 29 years old ($p < 0.001$), younger age at first sexual intercourse ($p = 0.048$), schooling less than eight years ($p = 0.020$), pregnancy ($p < 0.001$), viral load >50 copies/mL ($p = 0.020$), and no antiretroviral use ($p = 0.008$). After logistic regression, age less than 29 years old ($p = 0.010$, OR-8.25, 95% CI 1.67–40.76), schooling less than eight years ($p = 0.012$, OR-8.29, 95% CI 1.61–42.77), pregnancy ($p = 0.002$, OR-13.57, 95% CI 2.63–69.94), alcohol use before sexual act ($p = 0.025$, OR-14.54, 95% CI 1.39–151.61), and cervicitis ($p = 0.056$, OR-6.18, 95% CI 0.96–39.97) remained statistically significant.

Anorectal infection in women was associated with age less than 29 years old ($p < 0.001$) and pregnancy ($p = 0.023$), but it was neither associated with report of anal intercourse ($p = 0.485$) nor presence of symptoms. Only age less than 29 years old ($p = 0.001$, OR-10.54, 95% CI 3.23–34.41) remained associated with infection after logistic regression.

Discussion

A high prevalence of CT and NG infection in PLHA (12.3%) was found in this study, which was higher among men (17.7%) than women (9.2%). Infections were more prevalent in the anorectal (8.8%) site than in the genital (3.8%) site. Nowadays, there is an increase in anorectal STI, even among heterosexuals.[3,9,10] Some guidelines recommend CT and NG screening in extragenital sites on MSM, however it remains undefined for heterosexuals.[11,12] Some authors suggest focusing the screening on women who report anal intercourse.[10,13] The lack of association between women reporting anal intercourse and presence of anorectal infection in our study corroborate the findings of a study conducted in Baltimore, 2014.[14] The presence of bacterial infection with or without symptoms in anus and rectum, the practice of anal intercourse in the general population, and the increasing risk of HIV transmission reinforce the need for appropriate STI diagnosis and treatment on anorectal site. In this study, if the screening had been only urogenital, CT and NG infection diagnoses would have been missed in 88.9% of cases in men and 58.8% in women.

Amongst the women evaluated on this study, the association between anorectal and genital site of infection and younger age ($p < 0.001$ on both cases) and pregnancy ($p < 0.001$ and $p = 0.023$) highlights the need for screening that population during routine follow-up. These associations have been found in studies with women living with HIV/AIDS, and in the general population,[15–17] but it is not yet a routine in most services in Latin America. Recent studies detected a higher chance of HIV vertical transmission on women co-infected with NG or CT.[18,19] A systematic CT and NG investigation for young women, pregnant women, and women living with HIV/AIDS can contribute to the reduction of HIV transmission, and be an effective prevention measure.

In our study, the prevalence found on women's anorectal region was 5.3% for CT and 0.7% for NG; 29.4% of women with infection in the anorectal region denied practice of anal intercourse. There are few reports regarding the investigation of this site in women who do not admit anal intercourse or symptoms on the anal region.[10] The prevalence rates described in women with this practice vary between 8.6%–12.7% for CT and 1.0%–2.9% for NG on anorectal sites.[6,14,20] We found an association between presence of infection in cervix and in anorectal site, similar to other authors.[13] Some studies highlight the possibility of self-inoculation or "translocation" of genital site infection.[14,21] Our study underscores the need for investigating the anorectal site in women living with HIV/AIDS, regardless of anal intercourse practice.

We found a high rate of anorectal site infection among men (14.0% positive cases, 9.3% for CT and 5.7% for NG), similar to the CT and NG prevalence found in other studies in Brazil (10.0% and 2.5%), USA (7.9% and 6.9%), Netherlands (10.1% and 5.5%), and Russia (7.3% and 2.0%).[6,22–24] Only men who referred anal intercourse have CT and NG anal infection. The characteristics of this population are similar to those studied in other countries, with multiple sexual partners, receptive and insertive anal intercourse, higher education/socioeconomic situation. Despite the access to information on STI prevention, the high prevalence indicates a high exposure to NG and CT. These points toward an urgent need for reinforcing preventive measures, such as condom use, education on sexual transmission risk, and prompt access to bacterial and HIV infections post-exposure prophylaxis.

Table 3 – Univariate analysis of sociodemographic, clinical and sexual behavior-related risk factors for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG) infection in 498 people living with HIV, in Salvador, Brazil.

	Men								Women							
	Urogenital CT/NG (*n* = 6)				Anorectal CT/NG (*n* = 27)				Endocervical CT/NG (*n* = 11)				Anorectal CT/NG (*n* = 17)			
	n (%)	*p*	OR	95% CI	*n* (%)	*p*	OR	95% CI	*n* (%)	*p*	OR	95% CI	*n* (%)	*p*	OR	95% CI
Socio-demographic																
Age ≤29 years old	2 (3.8)	.669	1.32	0.24–7.45	12 (22.6)	.023	2.61	1.12–6.10	8 (10.8)	.001	9.21	2.38–35.71	11 (14.9)	.000	6.55	6.33–18.40
Single	4 (2.7)	.652	0.62	0.12–3.31	21 (14.3)	.832	1.11	0.42–2.95	5 (3.1)	.630	0.76	0.23–2.54	11 (6.9)	.285	1.73	0.63–4.82
White ethnicity	2 (6.7)	.235	2.84	0.50–16.25	7 (23.3)	.108	2.18	0.82–5.72	1 (4.5)	.567	1.30	0.16–10.65	3 (13.6)	.114	3.03	0.80–11.48
Less than 8 schooling years	0 (0.0)	1.000	1.04	1.01–1.07	2 (8.7)	.748	0.55	0.12–2.50	8 (7.3)	.020	5.10	1.32–19.63	7 (6.4)	.630	1.27	0.47–3.46
Monthly income ≤2 MW[a]	3 (2.9)	1.000	0.87	0.17–4.42	15 (14.7)	.809	1.11	0.49–2.51	11 (4.4)	.222	0.96	0.93–0.98	14 (5.6)	1.000	0.98	0.27–3.54
Pregnant women	–				–				6 (18.8)	.000	12.37	3.53–43.31	5 (15.6)	.023	4.03	1.32–12.30
Alcohol use	5 (3.5)	1.000	1.73	0.20–15.15	22 (15.3)	.376	1.59	0.57–4.45	3 (1.8)	.120	0.30	0.08–1.16	8 (4.8)	.530	0.73	0.27–1.95
Tobacco use	2 (4.8)	.614	1.83	0.32–10.33	6 (14.3)	.962	1.02	0.39–2.73	0 (0.0)	.608	1.04	1.02–1.07	1 (3.4)	1.000	0.58	0.07–4.51
Drug use	2 (3.8)	.661	1.37	0.24–7.71	9 (17.3)	.420	1.43	0.60–3.42	3 (7.0)	.191	2.38	0.60–9.35	1 (2.3)	.483	0.37	0.05–2.83
Sex-risk behaviors																
Lifetime sexual partners >3	2 (66.6)	.092	18.20	1.41–235.34	2 (66.6)	.370	3.10	0.27–35-38	6 (3.0)	.409	1.66	0.50–5.57	9 (4.5)	.237	1.80	0.67–4.80
Irregular condom use	2 (4.8)	.614	1.83	0.32–10.32	7 (16.7)	.583	1.30	0.51–3.32	3 (3.0)	1.000	0.75	0.19–2.88	3 (3.0)	.194	0.41	0.12–1.47
Alcohol before sex	3 (3.3)	1.000	1.13	0.22–5.72	17 (18.7)	.076	2.11	0.91–4.89	1 (0.8)	.031	0.14	0.02–1.09	6 (4.9)	.631	0.78	0.28–2.16
Drug before sex	1 (3.1)	1.000	1.01	0.11–8.92	4 (12.5)	1.000	0.86	0.28–2.67	1 (4.3)	.584	1.24	0.15–10.11	1 (4.3)	1.000	0.76	0.10–5.97
Transactional sex	0 (0.0)	1.000	1.04	1.01–1.07	2 (10.5)	1.000	0.70	0.15–3.22	2 (7.2)	.267	2.29	0.47–11.17	1 (3.6)	1.000	0.60	0.08–4.73
Anal receptive intercourse	5 (3.0)	.585	0.77	0.09–6.88	27 (16.2)	.029	0.84	0.78–0.90	4 (2.1)	.108	0.33	0.09–1.14	12 (6.3)	.485	1.46	0.50–4.26
Previous STI	6 (3.6)	1.000	0.96	0.94–0.99	26 (15.6)	.136	4.61	0.60–35.53	6 (4.0)	.734	1.23	0.39–4.13	6 (4.0)	.228	0.54	0.19–1.49
Patient complaints																
Anal fissure[b]	2 (3.4)	1.000	1.12	0.20–6.31	10 (16.9)	.456	1.38	0.59–3.23	–				–			
Pain in anal intercourse	2 (4.0)	.676	1.28	0.23–7.23	12 (24.0)	.028	2.55	1.09–5.99	–				–			
Dyspareunia	–				–				3 (4.5)	.706	1.36	0.33–5.62	5 (7.6)	.696	1.24	0.42–3.73
Genital discharge	1 (16.7)	.178	7.12	0.70–72.72	1 (16.7)	.594	1.26	0.14–11.27	6 (5.5)	.188	2.21	0.66–7.43	9 (8.3)	.131	2.10	0.79–5.62
Genital ulcer	1 (4.0)	.570	1.36	0.15–12.13	6 (24.0)	.122	2.21	0.79–6.16	0 (0.0)	1.000	1.04	1.02–1.06	0 (0.0)	.610	1.06	1.03–1.09
Pelvic pain	0 (0.0)	1.000	0.58	0.07–4.66	3 (17.6)	.713	1.35	0.36–5.04	6 (5.5)	.188	0.58	0.18–1.85	4 (3.7)	.313	0.53	0.17–1.68
Anal pain	2 (2.6)	1.000	0.74	0.13–4.14	14 (18.2)	.179	1.74	0.77–3.95	0 (0.0)	1.000	1.04	1.02–1.07	0 (0.0)	.614	1.06	1.03–1.09
Clinical findings																
Anal fissure[b]	1 (1.6)	.666	0.38	0.04–3.36	9 (14.1)	.914	1.05	0.44–2.51	–				–			
Genital discharge	1 (20.0)	.148	9.15	0.86–97.35	1 (20.0)	.533	1.56	0.17–14.49	5 (4.7)	.463	1.57	0.47–5.26	6 (5.6)	.985	1.01	0.36–2.81
Urethritis	1 (16.7)	.175	7.28	0.71–74.35	1 (16.7)	1.000	1.24	0.14–11.03	–				–			
Cervicitis	–				–				3 (13.6)	.037	5.43	1.33–22.14	3 (13.6)	.114	3.03	0.80–11.48
Painful anorectal exam[b]	0 (0.0)	.585	1.04	1.00–1.07	9 (25.0)	.022	2.88	1.13–7.34	–				–			
Painful bimanual exam	–				–				2 (7.7)	.270	2.28	0.47–11.15	0 (0.0)	.382	1.07	1.04–1.11
Viral load		.650	2.52	0.27–23.03		.626	0.79	0.31–2.01		.020	0.20	0.05–0.78		.051	0.36	0.12–1.04
≤40 cp/mL	4 (4.0)				12 (11.9)				3 (1.7)				6 (3.3)			
>40 cp/mL	1 (1.6)				9 (14.5)				8 (7.8)				9 (7.8)			
CD4+ ≤500 cells/μL	1 (1.7)	.653	0.42	0.05–3.84	10 (16.7)	.271	1.67	0.66–4.21	3 (3.6)	1.000	0.92	0.24–3.55	7 (8.4)	.178	1.99	0.72–5.55
No ART in use	1 (2.94)	1.000	1.07	0.12–9.48	5 (14.7)	.894	0.93	0.33–2.66	5 (10.0)	.008	0.22	0.06–0.74	5 (10.0)	.136	0.44	0.15–1.32

CT/NG indicates chlamydia and/or gonorrhea infection.

[a] MW, minimum wage ≈$194.

[b] Investigation on anal fissure and painful anorectal exam were only performed by the proctologist in male patients.

Antiretroviral therapy (ART), HIV viral suppression and improved immune status did not protect against STI infection in urogenital or anal sites in male patients of our study. The available evidence on these factors are controversial: some authors detected more infections in patients with higher TCD_4^+ cell counts,[25] but Cunha et al. did not find such association.[22] Some studies have shown an increased transmission of HIV in men or women infected by a bacterial STI, possibly due to the immune activation that increases expression of CCR5 receptors on mucosa and genital viral load.[7,26,27] Receptive unprotected anal sex represents risk of HIV transmission of 5–18 times higher on each sexual act.[28,29] The sense of protection currently publicized by the use of ART cannot be extended to the STIs on the population of men living with HIV.

This study has limitations: an interview was conducted face to face, leading to some degree of inhibition by the respondents, especially as to sexual practices. The population included in the study attends the service and, therefore, has access to care and guidance. There is no such data on HIV-negative people, or on those who do not attend specialized health centers. PLHA, is a population with increased prevalence of other STIs, and we have to be cautions when extrapolating these findings to the general population. Defining who is the heterosexual population who needs screening for infection in extragenital sites still requires more epidemiological and cost-effectiveness studies.

The "Treat as Prevention" strategy adopted in 2013 by Health Ministry of Brazil[30] and in 2015 by the WHO, intends to reduce HIV sexual transmission through increasing virological suppression. The impact of this policy on bacterial STIs transmission, such as syphilis, CT, and NG in PLHA is unknown. The increase of unprotected sex due to the possibility of not occurring sexual transmission of HIV could lead to an increase of these STIs. This may be a limitation to the future success of the "Treat as Prevention" strategy. Training of health professionals, access to early diagnosis and treatment of STIs, educational interventions on sexual practices, risk management, and prevention along with the population, especially PLHA and key populations, are essential measures to end the HIV epidemic, the global goal for 2030, and break bacterial STI chain-of-transmission.

Conflicts of interest

The authors declare no conflicts of interest.

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