The Brazilian Journal of
INFECTIOUS DISEASES

www.elsevier.com/locate/bjid

Original article

HIV testing and HIV knowledge among men who have sex with men in Natal, Northeast Brazil

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ARTICLE INFO

Article history:
Received 15 August 2018
Accepted 13 January 2019
Available online 10 February 2019

Keywords:
HIV testing
Men who have sex with men (MSM)
HIV knowledge

ABSTRACT

Background: Men who have sex with men (MSM) account for the highest prevalence of HIV in Brazil. HIV testing allows to implement preventive measures, reduces transmission, morbidity, and mortality.
Methods: We conducted a cross-sectional study to evaluate HIV testing during lifetime, factors associated with the decision to test, knowledge about HIV transmission, and use of condoms between MSM from the city of Natal, northeast Brazil.
Results: Out of 99 participants, 62.6% had been tested for HIV during lifetime, 46.2% in the last year. The most frequent reported reason to be tested for HIV infection was curiosity (35.5%). Correct knowledge about HIV was observed in only 9.2% of participants. In multivariate analysis, age (PR 0.95; 95%CI, 0.91–0.99; $p = 0.041$) and previous syphilis test (PR 4.21; 95%CI, 1.52–11.70; $p = 0.006$) were associated with HIV testing.
Conclusions: The frequency of HIV testing among MSM from Natal is rather low, especially in younger MSM, and knowledge about HIV transmission is inappropriate.

Introduction

The overall prevalence of HIV infection in Brazil is estimated at 0.4%, but the epidemic is highly concentrated in vulnerable populations, with 5.3% prevalence among sex workers and 19.8% in men who have sex with men (MSM) according to the last reports.[1] The higher risk of HIV infection among MSM may be partly explained by the practices and behaviors associated with anal sex and the gut tropism of HIV.[2,3] Besides that, behavioral vulnerabilities act together increasing the chances of HIV infection between MSM, such as no condom use, practice of transactional sex, use of drugs during sex, and sex with casual partners.[4]

In 2015, the Joint United Nations Program on HIV/AIDS (UNAIDS) proposed that by 2020, 90% of people living with HIV should be aware of their HIV status, as the first part of 90-90-90 strategy to end AIDS epidemic.[5] Early detection of HIV allows initiating care for proper treatment, which impacts in morbidity, mortality, and reduces further transmission.[2] In

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https://doi.org/10.1016/j.bjid.2019.01.003

Brazil, HIV testing is recommended for all pregnant women and patients with diagnosis of tuberculosis, visceral leishmaniasis, or sexually transmitted infections.[6] Studies estimated that the delay between infection and first CD4 count in Brazil was 4.3 years, showing that a large proportion of individuals still started treatment late in the country.[7] In Northeast Brazil 8800 new cases of AIDS are detected per year and in Natal the mean CD4 count at diagnosis is 269 cells/mm^3, pointing to late diagnosis of HIV.[1]

Although the group of MSM accounts for the highest prevalence of HIV in the country, there is no specific recommendation for HIV testing in this population in Brazil.[6] Data available from developed countries show that the proportion of MSM never testing for HIV is generally below 30%.[8,9] Since few studies evaluated HIV testing among MSM in Brazil, especially in Northeast region, our study aimed to access the rate and factors associated with HIV testing among MSM from Natal city, Northeast Brazil.

Materials and methods

Study design

This is a cross-sectional study, conducted in the city of Natal, between August 2011 and December 2012. The primary objective was to evaluate previous HIV testing among MSM from Natal during lifetime. Based on previous studies we anticipate that younger age and lower education would be associated with lack of testing,[10,11]

Study sample

Participants were MSM aged 18 years old or more, residing or working in Natal. They were recruited using respondent-driven sampling (RDS) approach initially.[12] Six MSM were selected as initial seeds, chosen through focus group. The focus group was conducted with 15 MSM representatives of artistic scene, student activism and social movement from Natal, the initial seeds were selected considering demographic characteristics, like age and socioeconomic status, and network size. Each seed was allowed to recruit three participants, using study coupons pre-printed with the study center phone number and location. Staff screened subjects in the study site for the following eligibility criteria: age over 18 years, living or working in the city of Natal, and having engaged in anal intercourse with another man in the previous year. Each included participant received three coupons to invite more people for the study.

Procedures

The study was conducted at a health care facility inside the university. The study questionnaire consisted of objective questions to be self-administered and based on a behavioral instrument used previously with this population in Brazil.[13] Participants responded to the questions in a private office. Questions included socioeconomic and demographic characteristics, history of HIV testing, reasons to do the test, use of condom in the last sexual relation, HIV status of sexual partners, transactional sex, previous syphilis test, knowledge of places were HIV testing is free, and adequate knowledge about HIV prevention, according to United Nations General Assembly Special Session on HIV/AIDS (UNGASS) indicator, defined as the percentage of respondents giving correct answers to all the following five questions[14]:

Can having sex with only one faithful, uninfected partner reduce the risk of HIV transmission? (yes);
Can using condoms reduce the risk of HIV transmission? (yes);
Can a healthy-looking person have HIV? (yes)
Can a person get HIV by using public toilets? (no)
Can a person get HIV by sharing a meal with someone who is infected? (no)

A rapid test for HIV using hole blood was offered for the participants at study site (Rapid Check HIV-1/2 and/or Bio-Manguinhos HIV-1/2), with pre- and post-test counseling and the result was given immediately, according to Brazilian guidelines.[15]

Statistical analysis

Sample size was calculated to be 95 subjects, assuming a prevalence of 60% for previous HIV testing during lifetime, 95% confidence and a 10% error, based on previous data from Adam et al. for 10 countries in Latin America.[16] Descriptive analysis included central tendency measures calculated for continuous variables and proportions were calculated for categorical variables. The association between previous HIV testing and explanatory variables was assessed by univariate analysis using Pearson's Chi-square or Fischer exact test when appropriate. For continuous variables, Student's "t" test was performed. Associations with a p-value less than 0.05 were considered significant. In order to verify the adjusted effect, Poisson Regression Modeling with robust variance were performed, including those variables with p-values less than 0.2. Data were analyzed using SPSS (Statistical Package Software for Social Science) version 20.0.

Ethics

The study was approved by the Ethic Research Committee of Federal University of Rio Grande do Norte (number 136/11). All participants signed a written informed consent.

Results

By November 2012, 70 subjects were included using RDS, despite many efforts of the study team to improve recruitment, including increase in the hours of operation of the study site and adding six more seeds. As our planed sample was 95 MSM, we decided to include a venue-based sample of additional 31 subjects recruited during the gay pride event in Natal city in December 2012. From 101 participants, two were excluded because they answered less than 70% of the questionnaire, totaling a sample of 99 subjects. Sociodemographic characteristics of participants are shown in Table 1. The mean

Table 1 – Sociodemographic characteristics of 99 MSM from Natal.

Variables	Mean/*n*	SD/%
Age (years)	29.1	9.7
Years of study	11.5	2.2
Month income (US dollars)	494	465
Race		
White	25	27.5
Mulatto/black	66	72.5
Occupation		
Employed	62	62.6
Unemployed	37	37.4
Use of condom in last anal sex		
Yes	68	71.9
No	27	28.1
Previous HIV test		
Yes	62	62.6
No	37	37.4
Previous syphilis test		
Yes	34	35.4
No	62	64.6
HIV test in the study		
Positive	6	9.2
Negative	59	90.8
Know where to test for HIV for free		
Yes	72	73.5
No	26	26.5

Table 2 – Reason for having done HIV test among MSM.

Reason	*n*	%
Curiosity	22	35.5
Self perception to be at risk for HIV infection	11	17.7
Medical recommendation	10	16.2
Blood donation	7	11.3
Requested at work	6	9.7
Partner wish	3	4.8
Total	62	100

age was 29.1 years (SD 9.7 years), 73.3% identified themselves as mulatto or black, mean monthly income was 494 US dollars (SD 465 dollars), and 61.5% were employed. Participants had a mean of 11.5 years of schooling (SD 2.2 years).

Out of 99 participants, 62.6% (CI 95% 52.5–71.7%) had been tested for HIV, 46.2% (CI 35.5–57%) in the last year. The most frequent reason to be tested was curiosity (35.5%), 17.7% because they perceived themselves to be at risk for HIV infection, and 16.2% were asked to be tested by a health professional (Table 2). The most frequent place for testing was public services mentioned by 52.4% (Table 3). Only 9.2% of participants had adequate knowledge about HIV transmission. The questions with the highest percentages of wrong answers were "Can a person get HIV by sharing a meal with someone who is infected?" (66.7% marked 'yes') and "Can a person get HIV by using public toilets?" (22.9% marked 'yes') [Table 4].

Transactional sex was frequent, as 42% reported having received money in exchange for sex in the previous six months. Use of condom in the last anal intercourse was

Table 3 – Places of HIV testing reported by MSM.

Places	*n*	%
Public service	32	51.6
Blood bank	6	9.7
Private service	11	17.7
Work place	5	8.1
Other	8	12.9
Total	62	100

mentioned by 71.9%. Only 13.1% were aware of the HIV status of sexual partners. Of the 63 MSM who agreed to perform an HIV test, six turned out positive (9.5%) [Table 1].

In univariate analysis, age (PR 0.93; 95% CI, 0.88–0.97; $p < 0.001$) and previous syphilis test (PR 1.85; 95% CI, 1.41–2.44; $p < 0.001$) were associated with HIV testing. Knowing a place where the HIV test could be done free-of-charge was also associated with HIV testing (PR 1.69; 95%CI, 1.05–2.71; $p = 0.017$), as most MSM did the test in public services (Table 5). In adjusted analysis, resulted from Poisson modeling, the variables "age", "previous syphilis test", and "knowing where HIV test was free" where included in a stepwise logistic regression analysis. In the final predictive model only "age" and "previous syphilis test" remained independently associated with previous HIV testing (Table 5).

Discussion

Our study found that 62.6% of MSM from Natal had been tested for HIV before. This rate was higher than the national average of 37% estimated for the general population in 2011[13] and the 51.6% found by Brito et al. in MSM from 10 Brazilian cities in 2009.[10] These rates are rather disappointing as MSM is a group with a high prevalence of HIV infection. The World Health organization and the Centers for Disease Control and Prevention (CDC) in United States, recommend that persons at high risk for HIV infection should be screened for HIV at least annually.[17,18] It should be pointed out that testing at any time was accounted for, rather than being restricted to the last year. If only testing in the previous year were considered the rate would be even lower (46.2%). Previous studies conducted in Argentina, Peru, and China showed HIV testing rates varying between 48% and 58%,[9,11,19] but studies from United States and Puerto Rico had a much better result (82–90%).[20,21]

Lack of knowledge about HIV transmission is one of the reasons that lead to low perceived risk of being infected. Hall et al. found that testing was higher among high school students if they were taught at school about AIDS or HIV.[22] Although adequate knowledge about HIV transmission was not significantly associated with HIV testing, it is noteworthy the low level of knowledge, despite the high educational level. The percentage of adequate knowledge in a study with the Brazilian general population was much higher, reaching 57.1%,[13] but Guimarães et al. indicate a decrease in the proportion of MSM with adequate HIV knowledge from 35.2% in 2009 to 23.7% in 2016.[23] Campaigns carried out by the Ministry of Health in Brazil have focused primarily on condom use as a way to avoid HIV infection, leaving aside clarification on situations that have no risk of transmission, such as sharing a meal or

Table 4 – Knowledge about HIV by MSM from Natal city, Brazil, 2012.

Question	n	%
Can a person get HIV by using public toilets?		
Yes	22	22.9
No	57	59.4
Don't know	17	17.7
Total	96	100
Can having sex with only one faithful, uninfected partner reduce the risk of HIV transmission?		
Yes	78	78.8
No	16	16.2
Don't know	5	5.1
Total	99	100
Can a healthy-looking person have HIV?		
Yes	94	94.9
No	2	2.0
Don't know	3	3.0
Total	99	100
Can using condoms reduce the risk of HIV transmission?		
Yes	96	97.0
No	2	2.0
Don't know	1	1.0
Total	99	100
Can a person get HIV by sharing a meal with someone who is infected?		
Yes	66	66.7
No	17	17.2
Don't know	16	16.2
Total	99	100

use of public toilets. In our country, AIDS is still a topic rarely addressed in schools, and even when this approach is carried out, it is usually not systematic. The school is often the only place where young people can receive reliable information. However, most often school teachers are NOT well prepared, and may end up delivering incomplete information. Alternative interventions like peer education and internet and social media strategies to access MSM have proven to be useful in studies from Peru and United States.[19,24] In 2015, a team of governmental, research, and non-governmental organizations in the city Curitiba in South Brazil launched and evaluated a multi-component implementation science project to improve HIV outcomes for MSM. This project, called "A Hora é Agora" ("The Time is Now") implemented a web-based platform and associated mobile application designed to provide HIV prevention information, allowing for self-assessment of risk and delivering HIV self-test kits. The project exceeded all expectations with 7352 HIV self-test requests over 24 months, as the initial goal was to distribute 1000 test kits per year, and was able to reach a large percentage (31%) of MSM who had never been tested before, with those between 18 and 28 years old reporting a higher percentage of first-time testers (36%) than those 29 years or older (18%).[25] The same project is now being implemented in the city of São Paulo.[26]

Younger age was associated with never testing for HIV in this study, which is worrisome since the last national epidemiological report data showed that the HIV epidemic is increasing in this group.[1] A study evaluating sexual risk behavior among MSM from 10 Brazilian cities showed that to be aged 25 years or less was independently associated with higher scores of risky behavior.[27] A recent study from Germany also showed that younger age (<25 years) was associated with lower rates of HIV testing.[28] The very absence of testing could be a contributing factor to the increased number of infections in this population, since people with HIV on antiretrovirals are less likely to transmit the virus than those who do not use them, a category which include HIV carriers that have not been diagnosed.[29,30] The proposal of treatment as prevention relies on a model of universal testing, reinforcing that barriers to HIV testing will become more relevant to the full spectrum of HIV care. Maximizing testing opportunities and reducing barriers to regular testing should be a central component of HIV prevention programs.[31]

This study has some limitations. The RDS technique was not effective for the population of MSM from Natal, as it has not reached the sample size initially calculated. Few seeds had enough waves to disperse the sample and make it closer to a probabilistic sample, even with all efforts from the research team to improve recruitment. Similar difficulties have been reported with the use of RDS technique by researches in Singapore.[32] We ended up analyzing our entire group as a non-probabilistic sample as a consequence of these difficulties. Therefore, these results may not be representative of the entire Natal MSM population. Some of the results that did not show statistical significance may have been influenced by the sample size that may have not been sufficient to show associations. However, there is relevance to the study because it represents a population that is difficult to access in

Table 5 – Univariate analysis of selected characteristics of MSM and prior HIV testing in Natal city, Brazil, 2012.

Variables	Previous HIV test				Total		Unadjusted		Adjusted[b]	
	Yes		No		*n*	%	*p*[a]	PR	*p*	PR
	n Mean	% SD	*n* Mean	% SD	Mean	SD		(CI 95%)		(CI 95%)
Occupation										
Employed	39	66.1	20	33.9	59	61.5	0.48	1.23		
Unemployed	21	56.8	16	43.2	37	38.5		(0.76–2.13)		
Total	60	62.5	36	37.5	96	100				
Age	31.8	10.0	24.4	6.9	29.1	9.7	<0.001	0.93 (0.88–0.97)	0.041	0.95 (0.91–0.99)
Race										
White	15	62.5	9	37.5	24	26.7	0.97	1.01		
Non-White	41	62.1	25	37.9	66	73.3		(0.55–1.84)		
Total	56	62.2	34	37.8	90	100				
Years of schooling	11.5	2.1	11.4	2.4	11.5	2.2	0.714			
Monthly income (US dollars)	528	511	434	370	494	465	0.359			
Knowledge about HIV										
Correct	6	66.7	3	33.3	9	9.2	0.82	1.11		
Incorrect	56	62.9	33	37.1	89	90.8		(0.42–2.91)		
Total	62	63.3	36	36.7	98	100				
Transactional sex										
No	38	69.1	17	30.9	55	57.9	0.34	1.37		
Yes	23	57.5	17	42.5	40	42.1		(0.80–2.34)		
Total	61	64.2	34	35.8	95	100				
Previous syphilis test										
Yes	31	91.2	3	8.8	34	35.8	<0.001	5.76	0.006	4.21
No	30	49.2	31	50.8	61	64.2		(1.90–17.45)		(1.52–11.70)
Total	61	64.2	34	35.8	95	100				
Know where HIV test is free										
Yes	50	71.4	20	28.6	70	72.9	0.017	1.69		
No	11	42.3	15	57.7	26	27.1		(1.05–2.71		
Total	61	63.5	35	36.5	96	100				
Use of condom in last anal sex										
Yes	46	67.6	22	32.4	68	71.9	0.27	1.37		
No	15	55.6	12	44.4	27	28.1		(0.79–2.37)		
Total	61	64.2	34	35.8	95	100				

[a] For categorical variables, Chi-Square or Fisher Exact test; for continuous variables, Student's "t" test.
[b] Poisson Regression Modeling

a location where no similar study had been performed previously.

Conclusion

The study shows that HIV testing rates are low among this sample of MSM, and younger age and previous syphilis test were associated with never testing in multivariate analysis. Knowing a place where the HIV test can be done free-of-charge was associated with HIV testing in univariate analysis but lost significance in the multivariate model. Actions that prioritize the dissemination of places where HIV testing can be done for free and targeted at young people seem to be most suitable for scaling up HIV testing among MSM in our reality. Also important is the fact that knowledge about HIV transmission was low, despite the high educational level of the participants, emphasizing the need for innovative approaches to disseminate prevention information for MSM.

Sources of support

National Fund of Health, Ministry of Health, Brazil.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Brasil, Ministério da Saúde, Departamento de DST/AIDS e HepatitesVirais. Epidemiological Bulletin of STD/AIDS; 2017. p. 11.
2. Baggaley RF, White RG, Boily MC. HIV transmission risk through anal intercourse: systematic review, meta-analysis and implications for HIV prevention. Int J Epidemiol. 2010;39:1048–63.

3. Boily MC, Baggaley RF, Wang L, et al. Heterosexual risk of HIV-1 infection per sexual act: systematic review and meta-analysis of observational studies. Lancet Infect Dis. 2009;9:118–29.
4. Torres RMC, Cruz MM, Périssé ARS, Pires DRF. High HIV infection prevalence in a group of men who have sex with men. Braz J Infect Dis. 2017;21:596–605.
5. UNAIDS. 90-90-90 An ambitious treatment target to help end the AIDS epidemic; 2015. p. 1–40.
6. Brasil, Ministério da Saúde, Departamento de DST/AIDS e HeptaitesVirais. Clinical protocol and therapeutic guidelines for management of HIV infection in adults; 2018. p. 412.
7. Szwarcwald CL, de Souza Junior PRB, Pascom ARP, et al. Results from a method for estimating HIV incidence based on the first CD4 count among treatment-naïve cases: Brazil, 2004–2013. JAIDS Clin Res. 2016;7:627.
8. Chapin-Bardales J, Sanchez T, Paz-Bailey G, et al. Factors associated with recent human immunodeficiency virus testing among men who have sex with men in Puerto Rico, National human immunodeficiency virus behavioral surveillance system, 2011. Sex Transm Dis. 2016;46:346–52.
9. Zhang L, Xiao Y, Lu R, et al. Predictors of HIV testing among men who have sex with men in a large Chinese city. Sex Transm Dis. 2013;40:235–40.
10. Brito AM, Kendall C, Kerr L, et al. Factors associated with low levels of HIV testing among men who have sex with men (MSM) in Brazil. PLOS ONE. 2015;10:e0130445.
11. Carballo-Diéguez A, Balán IC, Dolezal C, et al. HIV testing practices among men who have sex with men in Buenos Aires, Argentina. AIDS Care. 2014;26:33–41.
12. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. Soc Probl. 1997;44:174–99.
13. Brasil, Ministério da Saúde, Secretaria de Vigilância em Saúde. PCAP: Pesquisa de conhecimentos, atitudes e práticas na população brasileira; 2011.
14. UNAIDS. Monitoring the Declaration of Commitment on HIV/AIDS: guidelines on construction of core indicators: 2010 reporting; 2010.
15. Brasil, Ministério da Saúde. Technical Manual for diagnosis of HIV infection; 2013.
16. Adam PCG, Wit JBF, Toskin I, et al. Estimating levels of HIV testing, HIV prevention coverage, HIV knowledge and condon use among men who have sex with men (MSM) in low-income and middle-income countries. J Acquir Immune Defic Syndr. 2009;52:S143–51.
17. DiNenno EA. Recommendations for HIV screening of gay, bisexual and other men who have sex with men- United States, 2017. MMWR. 2017;66:830.
18. WHO. Consolidated guidelines on HIV testing services. Geneva: WHO; 2015.
19. Blas MM, Alva IE, Cabello R, et al. Risk behaviors and reasons for not getting tested for HIV among men who have sex with men: an online survey in Peru. PLoS ONE. 2011;6:e27334.
20. Finlayson TJ, Le B, Smith A, et al. HIV risk, prevention, and testing behaviours among men who have sex with men – National HIV Behavioural Surveillance System, 2 US cities, United States, 2008. MMWR SurveillSumn. 2011;60:1–34.
21. Lo YC, Turabelidze G, Lin M, et al. Prevalence and determinants of recent HIV testing among sexually active men who have sex with men in the St. Louis metropolitan area, Missouri, 2008. Sex Transm Dis. 2012;39:306–11.
22. Hall HI, Walker F, Shah D, Belle E. Trends in HIV diagnoses and testing among US adolescents and young adults. AIDS Behav. 2012;16:36–43.
23. Guimarães MDC, Kendall C, Magno L, et al. Comparing HIV risk-related behaviors between 2 RDS national samples of MSM in Brazil, 2009 and 2016. Medicine. 2018;97:S62–8.
24. Campbell CK, Lippman SA, Moss N, Lightfoot M. Strategies to increase HIV testing among MSM: a synthesis of the literature. AIDS Behav. 2018;22:2387–412.
25. De Boni RB, Lentini N, Santelli ACFS, et al. Self-testing, communication and information technology to promote HIV diagnosis among young gay and other men who have sex with men (MSM) in Brazil. J Int AIDS Soc. 2018;21:e25116.
26. http://www.ahoraeagora.org/sp [acessed 28.06.18].
27. Rocha GM, Kerr LRFS, Kendall C, Guimarães MDC. Risk behavior score: a pratical approach for assessing risk among men who have sex with men in Brazil. Braz J Infect Dis. 2018;22:113–22.
28. Marcus U, Gassowski M, Drewes J. HIV risk perception and testing behaviours among men having sex with men (MSM) reporting potential transmission risks in the previous 12 months from a large online sample of MSM living in Germany. BMC Public Health. 2016;16:1111.
29. Montaner JSG, Lima VD, Barrios R, et al. Association of highly active antiretroviral therapy coverage, population viral load, and yearly new HIV diagnose in British Columbia, Canada: a population-based study. Lancet. 2010;376:532–9.
30. Lundgren JD, Babiker AG, Gordin F, et al. Initiation of antiretroviral therapy in early asymptomatic HIV infection. N Engl J Med. 2015;373:795–807.
31. Flowers P, Knussen C, Li J, McDaid L. Has testing been normalized? An analysis of changes in barriers to HIV testing among men who have sex with men between 2000 and 2010 in Scotland, UK. HIV Med. 2013;14:92–8.
32. Chua AC, Chen MIC, Cavailler P, et al. Challenges of respondent driven sampling to assess sexual behaviour and estimate the prevalence of human immunodeficiency virus (HIV) and syphilis in men who have sex with men (MSM) in Singapore. Ann Acad Med Singap. 2013;42:350–3.