

Knowledge, Perception and Seroprevalence of HIV/STIS among Young Adults in Brazilian Amazon Region: A Population-Based Study

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Abstract

Objective: To evaluate the prevalence rates of HIV, syphilis, hepatitis B and hepatitis C in the State of Roraima, located in the Brazilian Amazonian Region, and their correlations with knowledge and perception regarding the subject.

Methods: A cross-sectional, population-based study, designed as a household survey to assess the seroprevalence of sexually transmitted infections (STIs) through a rapid test (not self-reported) and to describe the knowledge and perception of these infections among young adults (18-40 years) in Roraima in 2017. A randomized, hierarchical, conglomerate sampling method was used, and 727 participants were included in the capital and other 4 cities.

Results: The mean age was 31.1 years (\pm 12.9), and 57.7% were women. The prevalence rates were as follows: any STI, 5.8% (95% confidence interval (95% CI)=4.2%-7.8%), HIV, 0.91% (95% CI=0.42%-1.98%); syphilis, 3.2% (95% CI=2.10%-4.84%); and hepatitis B, 1.83% (95% CI=1.05%-3.17%). There was no positivity for hepatitis C. There were no significant differences in the prevalence of STIs between sexes, although men presented significantly lower knowledge and more distorted STI perceptions. Low levels of schooling, ignorance of sexual transmission of HIV, belief that AIDS is a curable disease and not being afraid of contracting HIV were independent risk factors for STIs.

Conclusions: The prevalence rates of HIV/STIs in young adults in Roraima are higher than the national averages, possibly due to deficits in knowledge and distorted perceptions regarding these infections, highlighting the need for the implementation of governmental actions with an emphasis on broad continuing education.

Keywords: HIV; Sexually transmitted disease; Syphilis; Hepatitis B; Knowledge

Introduction

Since the beginning of the AIDS epidemic in the 1980s, condom-based prevention has been the backbone and challenge for controlling the number of new cases of HIV/AIDS in Brazil and worldwide. At first, the main barrier was ignorance about HIV and its consequences, and a major effort by the Brazilian Ministry of Health was enacted to alert the population about the risks of various sexual behaviors. Consequently, recent evidence has shown that 98% of the Brazilian population knew about the HIV virus, and 90% of the population knew how to prevent infection in 2005 [1].

However, the persistence of the high incidence rates of HIV and other sexually transmitted infections (STIs) in Brazil suggests that other factors influence the sexual behavior of the population regarding personal care and AIDS prevention, inciting new challenges for the control of these diseases [2]. Sexual behavior is diverse, dependent on personal perceptions and influenced by social, cultural and economic factors. Despite the paucity of research addressing the perception of AIDS, some population-based studies have reported a reduction in the fear of HIV infection in Brazil [3]. The advent of high-efficiency antiretroviral therapy, which has transformed the natural history of the disease, allowing infected individuals to have long and virtually normal lives, may also have led to the banalization of the social representation of AIDS, which is no longer perceived as a severe and incurable disease [2]. The demystification of the relationship between HIV infection and death, which marked the initial phase of the epidemic, and disregard for

personal protection through the non-use of condoms, may represent important factors in maintaining HIV transmission, especially among younger people [4].

The incidence rate of AIDS in Brazil is 20.5 cases/100,000 inhabitants and has been relatively stable in recent years [5]. However, lately, the HIV/AIDS epidemic has changed. In addition to the heterosexualization, feminization and pauperization of the epidemic, we highlight its internalization, or the tendency of the infection to reach municipalities of smaller sizes [6]. The northern region of Brazil (located in the Amazon region) showed a 74% increase in the number of new annual cases from 2004 to 2013. In particular, the state of Roraima, located in the extreme north of the Brazilian Amazon, recorded a high incidence of AIDS cases (31.3/100,000) in 2014, surpassing the national average incidence [5]. The epidemiological profile of Roraima reveals that the disease affects mainly non-indigenous (95.69% of cases) and

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young adults between 20 and 39 years of age (65.6% of new cases). The incidence rate among young adults (30 to 39 years) has reached 103.7/100,000 in Roraima, the second highest in the country, suggesting that this group practices risky sexual behavior, with low condom use. The objective of this work is to conduct a seroprevalence study of STI, including HIV, syphilis, hepatitis B and hepatitis C, and to correlate the results with perceptions and knowledge regarding these diseases in a population-based sample of young adults in Roraima, Brazil.

Methods

Study design

This is a cross-sectional, quantitative analysis study, designed as a household survey to evaluate STI seroprevalence through a rapid test, and to describe the knowledge and perception of young adults (18-40 years) of these infections, conducted in 2017 in Roraima, a state located in the Amazon region of Brazil.

Population

The state of Roraima, located in the extreme north of the Brazilian Legal Amazon, has 15 municipalities, where 420,000 people live. It is characterized by having the largest indigenous village population (15%). The indigenous cultural influence in the population is characterized by early sexual initiation and multiparity. Roraima is also characterized by 2 international borders (Venezuela and English Guiana). The state has 15 municipalities, and the capital, Boa Vista, concentrates approximately 65% of the state's population. The age structure of Roraima has a broad base, with a strong relative representation of young people. More than one-third of the population (37.4%) are between 20 and 39 years old, and 52% are male.

Sample and sampling

A multilevel, hierarchical, conglomerate random sampling method was used. At the first level, each municipality were considered a conglomerate sample and were enumerated. Five municipalities were randomly selected, taking into account the number of inhabitants of each municipality as its weight. In the second level, each block of these 5 municipalities was assumed as a sample conglomerate. These blocks were listed, including blocks of suburban and small villages areas. The number of blocks drawn was adjusted (weighted) to the population in each pre-selected municipality. A sequence of random numbers was generated to define the order of visits to the homes of each block, until reaching the sample goal. For the calculation of the sample size, the prevalence of STIs in the target population was estimated at 1.5%, based on a similar study conducted in the Brazilian Amazon [7]. Considering a 95% confidence interval (95% CI) and an acceptable error of 1%, a minimum sample size of 588 adults was obtained. Considering a loss of samples or rejection of testing of up to 20%, the sample size was approximately 706 participants.

Research procedures

The research team visited all households in the randomly selected blocks, during weekends, in the order of random selection until reaching the sample goal. All adults between 18 and 40 years of age were invited to participate in the study individually and consecutively. After extensive explanation and obtaining their consent to participate via signing the consent term, the volunteer responded to a form by face-to-face interview, preferably in the absence of other co-residents of the volunteer. The form used was adapted from the study of Miranda et al. [8], addressing items on demographics, knowledge and perceptions about HIV/STIs.

Subsequently, participants were invited to perform a rapid test for HIV by means of a qualitative test for detection of antibodies specific for HIV-1/2 (TR DPP® HIV-1/2, Bio-Manguinhos, Rio de Janeiro, Brazil), for syphilis (Syphilis Test®, Bioeasy), for hepatitis B (Alere® Hepatitis B Test Kit, Alere) and for hepatitis C (Alere® Hepatitis C Test Kit, Alere), through a digital puncture performed in the volunteer's own home. The results were reported in 30 minutes. In case of a positive test, the test was repeated for confirmation. Those who were present but did not reside in the household, those who were outside the age group and those who did not consent to participate in the research were excluded. The rejection of the rapid test for STIs did not exclude the participation of the volunteer (their data were used only to address knowledge and perception).

Data analysis

The outcome variable was the positivity for any STI. Demographic data, knowledge and perception about HIV/STIs were interpreted as explanatory variables. Descriptive statistical analysis included distribution frequencies for categorical variables, and means (with standard deviation) or medians (with interquartile range) for continuous variables, with normal and non-normal distribution, respectively. The 95% CIs were estimated based on binomial distribution. For comparison of sample means, Student's t-test was used for variables of normal distribution and with homogeneity of sample variances. Otherwise, the Mann-Whitney test was used for this purpose. The chi-square test was used to compare differences in the proportions of categorical variables. Odds ratios (ORs) and 95% CIs were calculated in univariate analysis and adjusted odds ratios (aORs) in multivariate logistic regression analysis. The criterion for selection of explanatory variables for entry into the multivariate analysis was the critical value of $p < 0.15$ in the univariate analysis. The data were tabulated by double data entry and were analyzed using EpiInfo® software version 7.1.3 (CDC, Atlanta, GA, USA).

Ethical issues

The study was approved by the Research Ethics Committee of the Federal University of Roraima (Document n. 44535315.3.0000.5302). All volunteers were fully informed about the purposes and methods of the research, and formal consent was obtained prior to any study procedure. At the end of participation, all participants received post-test counseling. Positive cases were referred for treatment in a specialized Infectology Service.

Results

The study included 727 participants. Of these, 69 (9.5%) rejected the serological test; therefore, the prevalence analyses are based on a sample of 658 participants. Most of participants ($n=492$; 68.7%) were inhabitants of the capital city, Boa Vista, and 235 (31.3%) of other municipalities in the countryside of the state. The mean age was 31.1 years (± 12.9), and the majority of the sample was represented by women (57.7%). More than half (55.9%) of the participants had stable partners, and the Catholic religion was the most informed (43.5%), followed by protestant religions (34.6%). Almost one-third of the participants (32.7%) reported a household income of up to US\$300 (approximately one minimum wage) and reported receiving government benefits (32.6%). Regarding schooling, the most prevalent was high school (75.7%), followed by university education (24.3%); only 1.9% of the participants were illiterate (Table 1).

Among the 658 participants tested, 38 were positive for some STIs, leading to a combined prevalence of 5.8% (95% CI=4.2%-7.8%). The

prevalence rates in the sample were as follows: HIV (n=6), 0.91% (95% CI=0.42%-1.98%); syphilis (n=21), 3.2% (95% CI=2.10%-4.84%); and hepatitis B (n=12), 1.83% (95% CI=1.05% to 3.17%). No participants were positive for hepatitis C, and there were no cases of co-infection. None of the positive participants reported prior knowledge of their condition. Table 2 compares these prevalence rates by sex.

Regarding STI knowledge, despite the fact that most of the participants were aware that HIV could be sexually transmitted (95.4%) and that there is a condom for female use (92.9%), 15.3% of the sample was unaware of the prevention of transmission through condom use. More than half of the participants (57.1%) were unaware that HIV carriers may be asymptomatic. A considerable portion of the sample was unaware of the fact that HIV/AIDS could be treated medically (22.2%); however, 17.6% of participants believed that HIV/AIDS infection had curative treatment. One-third of the sample (34.6%) were unaware of the sexual transmission of syphilis, and 41.0% of the sexual transmission of hepatitis B. Most (61.8%) were unaware of the mechanism of prevention of hepatitis B by condom use, and 27.8% did not know that syphilis also affects women. In 7 of the 10 STI knowledge questions, we found a significantly lower knowledge in men compared with women (Table 2). Regarding STI perception issues, although the majority (96.0%) agreed that AIDS is a serious disease, 12.5% of the sample stated that they were not afraid of contracting HIV. The non-fear of contracting HIV was significantly higher in men than in women (15.3% vs. 10.4%, respectively, p=0.03). We observed that a significant prevalence of the sample reported a distorted perception about the risk group for HIV transmission: 15.2% believed that AIDS is a disease restricted to homosexuals, prostitutes and drug users (this perception was significantly higher among men than women-20.8% vs. 11.2%, p=0.0003), and 9.3% of those surveyed believed that AIDS did not affect the elderly population. The perception of invulnerability (i.e., having no risk of contracting) to STIs was also very high: 63.5% for HIV, 62.1% for syphilis and 48.5% for hepatitis B, with no difference between sexes (Table 2).

In the univariate analysis, low schooling correlated strongly with

the prevalence of STIs. Having less than 9 years of schooling (up to elementary school) significantly increased the prevalence of STIs in relation to those with higher schooling (14.7% vs 3.3%, respectively, p<0.0001), increasing the chance of infection. Being a resident of inland municipalities also doubled the prevalence of STIs compared with residents in the capital (8.9% vs 4.2%, respectively; p=0.017), while age under 25 years proved to be a protection factor, reducing the chance of having an STI by 60% (OR=0.41; 95% CI=0.19-0.89). Marital status and religion did not influence this outcome. Regarding STI knowledge, the lack of knowledge in 4 items represented risk factors for infection in relation to the participants who had such knowledge: not knowing that condom use prevents HIV infection (17.0% vs 4.9%, respectively, p=0.0006); not knowing that HIV can be sexually transmitted (17.4% vs 5.2%, respectively, p=0.006); not knowing that AIDS can be medically treated (11.0% vs 4.3%, respectively, p=0.002); and believing that AIDS is a disease that has a cure (9.5% vs 4.9%, respectively, p=0.04). It is noteworthy that the lack of knowledge about the mechanism of HIV prevention through condom use almost quadrupled the probability of STIs in the sample (OR=3.97, 95% CI=1.71-8.24). The other behavioral questions did not significantly influence the outcome. Still, in the univariate analysis, distorted perceptions about groups at risk for HIV had a strong influence on the chance of infection in this sample. Believing that HIV is an infection restricted to homosexuals, prostitutes and drug users more than doubled the odds of testing for STIs (OR=2.30, 95% CI=1.17-4.81), as did believing that the elderly population does not have to worry about HIV (OR=2.31, 95% CI=1.01-5.51). Not being afraid of contracting HIV also doubled the chance of having an STI (OR=2.25, 95% CI=1.02-4.94), similar to the feeling of no risk of contracting hepatitis B (OR=1, 99, 95% CI=1.01-3.92). Table 3 details the univariate analysis.

When re-analyzed in the multivariate analysis, the variables that were confirmed as independent risk factors for STIs were low schooling (adjusted OR=4.26; 95% CI=2.08-8.60), not knowing that HIV can be sexually transmitted (adjusted OR=2.20; 95% CI=1.06-4.59), not knowing that AIDS is an incurable disease (adjusted OR=2.40; 95% CI=1.01-4.99) and not being afraid to contract HIV (adjusted OR=2.26, 95% CI=1.01-5.02).

Sample characteristics	n (%)	n (± SD)
Municipality of residence		
Boa Vista (capital)	492 (68.7%)	
Iracema	91 (12.5%)	
Cantá	53 (7.2%)	
Bonfim	47 (6.5%)	
Pacaraima	44 (6.0%)	
Marital status		
Without a fixed sexual partner	320 (44.1%)	
With a fixed sexual partner	407 (55.9%)	
Age		31.1 (± 12.9)
Up to 25 years old	301 (41.4%)	
Older than 25 years old	426 (58.6%)	
Schooling		
Up to high school	551 (75.7%)	
Higher education	176 (24.3%)	
Sex		
Male	307 (42.3%)	
Female	420 (57.7%)	
Household income		
Up to 1 minimum wage (US\$300)	238 (32.7%)	
Above 1 minimum wage	489 (67.3%)	
Religion		
Catholic	315 (43.5%)	
Protestant	250 (34.6%)	
No religion	134 (18.5%)	
Other religions	24 (3.4%)	

Table 1: Sample characteristics.

Discussion

Our study revealed prevalence rates of HIV (0.91%) and syphilis (3.2%) that were substantially higher than the national estimates and rates reported in other surveys. It should be noted that this study was population-based and employed random selection with statewide coverage and was not restricted to a sex or societal group. According to the WHO, in 2016, approximately 36 million people were living with HIV worldwide. Of these, 3.4 million were concentrated in the Americas [9]. In Brazil, the estimate of people living with HIV varied from 0.4% to 0.7% of the population between the ages of 15 and 49 years, lower than the global prevalence of 0.8%, according to the latest UNAIDS reports in 2015 [10]. Seroprevalence studies of HIV in Brazil based on population are scarce. Pereira et al. conducted a nationwide study on HIV prevalence among 35,000 pregnant women (15-49 years) in prenatal evaluations [11]. The authors reported a global HIV prevalence of 0.38%, which was higher in the age range of 30 to 39 years (0.6%), and reported that the prevalence was 0.33% in the Northern region of Brazil. In a similar study, conducted among 23,000 pregnant women in prenatal evaluations throughout Brazil, the prevalence of HIV was 0.4%, and that of syphilis was 1.02% [12]. In a hospital-based study conducted in Espírito Santo-Brazil, Miranda et al. described an HIV seroprevalence of 0.6%. A study in the Amazon region of Brazil deserves attention [13]. Ribeiro et al. conducted a population-based seroprevalence study among 1501 volunteers in São Gabriel das Cachoeiras-Amazonas [7]. The prevalence rates of HIV were 0.37% in men and 0% in women, and those of syphilis were 1.12% and 2.69%, respectively. The authors noted that 85% of the sample was indigenous, geographically isolated, with peculiar sociocultural characteristics, with low prevalence rates of STIs [14]. However, the high prevalence of syphilis stands out, confirming the recent advent of the resurgence of the disease in Brazil. In 2015, there was a 32.7% increase in cases of acquired syphilis reported in Brazil in relation to 2014, when the disease was already considered an epidemic by the Ministry of Health.

Due to the free availability of the hepatitis B vaccine for Brazilian children, a significant reduction in the prevalence of hepatitis B after a decade of vaccination was documented, reaching 0.37% of the national population in 2010, and has been remained stable since then. Because of the availability of the vaccine, the sexual route is the most common means of transmission of hepatitis B in Brazil. It is noteworthy, however, that the vaccination program (started in 1999) does not have satisfactory coverage for today's adults, the targets of our study. The prevalence of hepatitis B in our study was 1.6%, higher than the national estimate, but lower than expected for the Amazon region of Brazil, where some studies showed higher prevalence rates for hepatitis B: 3.3% in Amazonas, 5.5% in Pará and 6.7% in Rondônia [15-17].

Contrary to what would be expected, we did not observe a significant difference in the prevalence of STIs among sexes, although women presented significantly superior knowledge to men in 7 of the 10 questions of knowledge and had less distorted perceptions. Data from the Brazilian Ministry of Health revealed that almost three times as many new HIV cases were reported in men as in women in Brazil in 2016 [5]. It is noteworthy that in the past, women were the minor population affected, but over the decades, a process of feminization of the AIDS epidemic has been observed due to the greater involvement of heterosexual men. Their vulnerability has also been described since women are at a disadvantage in relation to the adoption of preventive measures and in terms of inequality in the power of resolutions between men and women on safe ways of exercising sexuality [18,19].

The main risk factor in our sample was low schooling. Having less than 7 years of study quadrupled the chance of STI positivity and was an independent risk factor. In Brazil, according to the Epidemiological Bulletin of the Ministry of Health, the majority of the population living with HIV/AIDS have low levels of education, and 82% of AIDS cases in 2016 have been reported in people with incomplete schooling [5]. In this sense, multiple factors may corroborate the high prevalence of HIV/STIs in men and women in Roraima, but the role of the knowledge deficit on the subject in this study stands out. Knowledge and perception of the population on the subject can decisively influence the sexual

Seroprevalence, knowledge and perception of HIV/STIs	Men	Women	p value (men vs women)	Overall
Prevalence of any STI (rapid test positivity for any STI)	6.2%	5.5%	ns	5.8%
Prevalence of HIV	0.85%	1.0%	ns	0.91%
Prevalence Syphilis	4.0%	2.6%	ns	3.2%
Prevalence Hepatitis B	2.2%	1.5%	ns	1.8%
Prevalence Hepatitis C	0%	0%	-	0%
Knowledge on HIV/STIs				
Do not know that HIV can be sexually transmitted	7.3%	2.6%	0.007	4.6%
Do not know that condom use prevents HIV	17.2%	14.1%	ns	15.3%
Do not know that there is a female condom	11.3%	4.2%	0.0007	7.1%
Do not know that HIV-positive people may be asymptomatic	63.9%	52.3%	0.004	57.1%
Do not know that HIV/AIDS has can be medically treated	26.6%	19.1%	0.02	22.2%
Do not know that HIV/AIDS is incurable	19.3%	16.4%	ns	17.6%
Do not know that Hepatitis B can be sexually transmitted	44.1%	38.1%	ns	41.0%
Do not know that condom use prevents Hepatitis B	70.4%	55.7%	0.0001	61.8%
Do not know that Syphilis can be sexually transmitted	44.5%	27.6%	0.0001	34.6%
Do not know that Syphilis affects women	36.5%	21.6%	0.0002	27.8%
Perception on HIV/STIs				
Believes that AIDS is not a severe disease	3.9%	4.0%	ns	4.0%
AIDS only affects gays, prostitutes and drug users	20.8%	11.2%	0.0003	15.2%
AIDS only affects younger rather than older people	11.1%	8.1%	ns	9.3%
Not afraid to contract HIV	15.3%	10.4%	0.03	12.5%
Believes that has no risk of contracting HIV	64.8%	62.6%	ns	63.5%
Believes that has no risk of contracting Syphilis	65.5%	59.7%	ns	62.1%
Believes that has no risk of contracting Hepatitis B	49.8%	47.6%	ns	48.5%

ns: not significant

Table 2: Evaluation of knowledge, perception and seroprevalence of HIV and STIs, Roraima, 2017.

	Prevalence of any STI	p value	OR (95% CI)	Adjusted OR (95% CI)
Demographics				
Up to 8 years of study 9 years or more of school	14.7% 3.29%	<0.0001	5.09 (2.60 - 9.95) 1	4.26 (2.08 - 8.60) 1
Living in countryside cities Living in the capital city	8.9% 4.2%	0.017	2.17 (1.12 - 4.20) 1	1.44 (0.71 - 2.91) 1
Up to 25 years of age Older	3.3% 7.5%	0.021	0.41 (0.19 - 0.89) 1	0.67 (0.30 - 1.48) 1
No religion Any religion	5.0% 5.9%	ns	0.84 (0.34 - 2.05) 1	-
Fixed sexual partner Single/divorced	6.2% 5.2%	ns	1.20 (0.61 - 2.10) 1	-
Up to 1 minimum wage income Above 1 minimum wage income	6.3% 5.0%	ns	1.23 (0.57 - 2.14) 1	-
Knowledge and Perception of HIV/AIDS				
The use of condom prevents STIs Ignored Known	17.0% 4.9%	0.0006	3.97 (1.71 - 8.24) 1	2.49 (0.91 - 6.78) 1
HIV can be sexually transmitted Ignored Known	17.4% 5.2%	0.006	3.76 (1.34 - 10.4) 1	2.20 (1.06 - 4.59) 1
AIDS can be medically treated Ignored Known	11% 4.3%	0.002	2.71 (1.39 - 5.36) 1	1.62 (0.69 - 3.81) 1
AIDS is an incurable disease Ignored Known	9.5% 4.9%	0.04	1.99 (1.06 - 4.15) 1	2.40 (1.01 - 4.99) 1
HIV is restricted to gays, prostitutes and drug users Agrees Disagrees	10.6% 4.9%	0.022	2.30 (1.17 - 4.81) 1	1.97 (0.98 - 4.76) 1
Older people do not need to worry about HIV Agrees Disagrees	11.3% 5.2%	0.05	2.31 (0.97 - 5.51) 1	1.23 (0.43 - 3.52) 1
Fear of contracting HIV No Yes	10.7% 5.0%	0.03	2.25 (1.02 - 4.94) 1	2.26 (1.01 - 5.02) 1
There is a condom for female use Ignored Known	6.9% 5.6%	ns	1.26 (0.54 - 2.95) 1	-
HIV-positive people may be asymptomatic Ignored Known	6.9% 4.2%	ns	1.67 (0.82 - 3.37) 1	-
AIDS is a severe disease Agrees Disagrees	13.0% 5.5%	ns	2.57 (0.71 - 9.06) 1	-
Believes that has a risk of contracting HIV No Yes	5.66% 5.98%	ns	0.94 (0.47 - 1.85) 1	-
Knowledge and Perception of Hepatitis B and Syphilis				
Believes that has a risk of contracting Hepatitis B No Yes	7.5% 3.9%	0.04	1.99 (1.01 - 3.92) 1	1.95 (0.96 - 3.93) 1
Hepatitis B can be sexually transmitted Ignored Known	5.4% 6.3%	ns	0.83 (0.43 - 1.63) 1	-
Condom use prevents Hepatitis B Ignored Known	6.6% 5.1%	ns	1.31 (0.68 - 2.53) 1	-

Syphilis has sexual transmission				
Ignored	7.0%	ns	1.39 (0.71 - 2.71)	-
Known	5.1%		1	
Women are vulnerable to Syphilis				
Ignored	4.9%	ns	0.79 (0.36 - 1.71)	-
Known	6.1%		1	
Believes that has a risk of contracting Syphilis				
No	6.8%	ns	1.75 (0.83 - 3.68)	-
Yes	4.0%		1	

Ns: Not significant

Table 3: Univariate and multivariate analyses between sociodemographic characteristics, knowledge and perception about STIs, considering seroprevalence of any STI as an outcome, Roraima, 2017.

practices adopted by young people and adults [4]. In a survey conducted with high school students in Santa Catarina, Brazil, knowledge about HIV transmissibility was substantially higher: 99.8% reported knowing that the HIV virus could be transmitted sexually [20]. The same was observed in adults and the elderly in Minas Gerais, where 95.5% were aware of the transmissibility of the HIV virus in unprotected sex [21]. In our study, approximately 95% of the sample knew that HIV can be sexually transmitted. Although a small fraction of participants were unaware of this crucial information (4.4%), this group had a three-fold higher chance of having an STI, reaffirming the predictive power of this knowledge. The policy of STI prevention by the Ministry of Health of Brazil has been based precisely on the incentive to use condoms (and its large free distribution), since much effort had been put into educating the population about means of transmission and prevention of AIDS for the population. Although some studies have shown that 90% of Brazilians already had adequate knowledge about how to prevent HIV infection in 2005, the findings from the present study show a setback [1]. In our study, more than 17% of men and 14% of women were unaware of the role of condoms in AIDS prevention ($OR > 2$). The lack of knowledge was even more deficient for hepatitis B and syphilis. Our data corroborate the Survey of Knowledge, Attitudes and Practices in the Brazilian Population, conducted in 2013 by the Ministry of Health of Brazil, which showed that 6% of respondents in Brazil did not have adequate knowledge that "using a condom is the best way to prevent the AIDS virus from being transmitted during intercourse." In the North Region, 13% of respondents did not have this knowledge. Therefore, the coverage and strategies of information dissemination and prevention campaigns need to be improved, especially for less developed regions [22].

The lack of knowledge about HIV/STIs has already been related to distortions of perception about the subject and was ratified in our sample. More than half of the sample did not know that AIDS patients may be asymptomatic, and 15% of individuals believed that AIDS is a disease restricted to homosexuals, prostitutes and drug users [23,24]. This distorted perception of risk groups doubled the chance of having STIs. The same was reported by Lazzarotto et al. in 2008, which identified that one-third of respondents believed that AIDS "occurs only in male homosexuals, prostitutes and drug addicts," revealing that the misconception of at-risk groups persists in the population, even decades after the spread of the epidemic in Brazil [25]. These data suggest a prevalent conception in the population of some invulnerability to STIs, especially among men, because they do not consider themselves as belonging to these at-risk groups. This belief may encourage unsafe sexual practices and may explain the high prevalence of HIV/STIs in Roraima. In fact, approximately 60% of our sample believed that they had no risk of contracting HIV and syphilis, and almost 50% did not believe they were at risk of contracting hepatitis B. In the 1990s, the absence of a cure, the association between AIDS and death and social influences on the sym-

bolic representation of AIDS generated an effective response expressed by the irrational fear of HIV contamination and triggered exaggerated mental memory operations, perceptions and attitudes; this reality has been unbundled in recent decades. By 2017, nearly 20% of men in Roraima believed that HIV/AIDS is cured, underscoring the perception of the banalization of the disease [26]. Consequently, not being afraid of contracting HIV was reported in 15% of the men in our study and was one of the most important risk factors in this analysis, more than doubling the chance of STI positivity.

This study has limitations. First, the cross-sectional design did not allow the use of temporality as a criterion of causality since risk factors and outcomes were measured synchronously, and the bias of reverse causality could not be eliminated. Second, the conglomerate sampling method may fail to make the sample faithfully representative of the population. Finally, the use of questionnaires for data collection relating to risk factors may fail due to concealment of the truth and answer masking, in addition to the possibility of selection bias inherent in not accepting rapid testing. However, the achieved sample target and the random selection of test houses strengthen the credibility of the results.

Conclusion

We concluded that the prevalence rates of HIV/STIs are high among young adults in Roraima, Brazil, higher than the national prevalence, which may be explained by deficits in knowledge (mechanisms of transmission and prevention) and distorted perceptions about these diseases (e.g., the belief that the disease is restricted to groups at risk and a false sense of invulnerability), influencing unsafe sexual practices. These data highlight the need for the implementation of governmental actions with an emphasis on broad continuing education, with special scope for the less favored segments of society.

Ethics Approval

The study was approved by the Research Ethics Committee of the Federal University of Roraima (Document n. 44535315.3.0000.5302). All volunteers were fully informed about the purposes and methods of the research, and formal consent was obtained prior to any study procedure.

Availability of Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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References

1. Ferreira MP (2003) Knowledge and risk perception of HIV/AIDS: A profile of the Brazilian people in 1998. *Cadernos de Saúde Pública* 19: S213-S22.
2. Dourado I, Veras MA, Barreira D, de Brito AM (2006) AIDS epidemic trends

- after the introduction of antiretroviral therapy in Brazil. *Rev Saude Publica* 40: 9-17.
3. Reis RK, Gir E (2009) Vulnerability and prevention of sexual HIV transmission among HIV/AIDS serodiscordant couples. *Rev Esc Enferm* 43: 662-669.
 4. Almeida SAD, Nogueira JDA, Goldfarb MPL, Batista FL, Barrêto AJR, et al. (2014) Young people's conception of HIV/AIDS and the use of condoms in sexual intercourse. *Revista Gaúcha de Enfermagem* 35: 39-46.
 5. <http://www.aids.gov.br/publicacao/2016/boletim-epidemiologico-2016>
 6. Brito AMD, Castilho EAD, Szwarcwald CL (2001) AIDS and HIV infection in Brazil: A multifaceted epidemic. *Revista da Sociedade Brasileira de Medicina Tropical* 34: 207-217.
 7. Ribeiro LV, Sabido M, Galban E, Guerra JA, Mabey D, et al. (2015) Home-based counseling and testing for HIV and syphilis: An evaluation of acceptability and quality control, in remote Amazonas State, Brazil. *Sex Transm Infect* 91: 94-96.
 8. Miranda AE, Figueiredo NC, McFarland W, Schmidt R, Page K (2011) Predicting condom use in young women: demographics, behaviours and knowledge from a population-based sample in Brazil. *Int J STD AIDS* 22: 590-595.
 9. <http://www.who.int/gho/hiv/en/>
 10. <http://unaids.org.br/estatisticas/>
 11. Pereira GF, Sabido M, Caruso A, Oliveira SB, Mesquita F, et al. (2016) HIV prevalence among pregnant women in Brazil: A national survey. *Rev Bras Ginecol Obstet* 38: 391-398.
 12. Domingues RM, Szwarcwald CL, Souza Junior PR, Leal Mdo C (2014) Prevalence of syphilis in pregnancy and prenatal syphilis testing in Brazil: Birth in Brazil study. *Rev Saude Publica* 48: 766-774.
 13. Miranda AE, Filho ER, Trindade CR, Gouvea GM, Costa DM, et al. (2009) Prevalence of syphilis and HIV using rapid tests among parturients attended in public maternity hospitals in Vitoria, State of Espírito Santo. *Rev Soc Bras Med Trop* 42: 386-391.
 14. Ruffinen CZ, Sabido M, Diaz-Bermudez XP, Lacerda M, Mabey D, et al. (2015) Point-of-care screening for syphilis and HIV in the borderlands: Challenges in implementation in the Brazilian Amazon. *BMC Health Serv Res* 15: 495.
 15. Braga WSM, Brasil LM, Souza RABD, Melo MSD, Rosas MDG, et al. (2004) Prevalence of hepatitis B virus (HBV) and hepatitis D virus (HDV) Infections in Lábrea, Purus River Basin, Western Brazilian Amazon. *Epidemiologia e Serviços de Saúde* 13: 35-46.
 16. Nunes HM, Monteiro MRDCC, Soares MDCP (2007) Prevalence of hepatitis B and D serological markers in the Parakanã, Apyterewa Indian Reservation, Pará State, Brazil. *Cadernos de Saúde Pública* 23: 2767-2779.
 17. Katsuragawa TH, Cunha RPDA, Salcedo JMV, Souza DCAD, Oliveira KRVD, et al. (2010) High seroprevalence of hepatitis B and C markers in the upper Madeira River region, Porto Velho, Rondônia State, Brazil. *Revista Pan-Amazônica de Saúde* 1: 91-96.
 18. Teixeira AM, Knauth DR, Fachel JM, Leal AF (2006) Teenagers and condom use: Choices by young Brazilians from three Brazilian State capitals in their first and last sexual intercourse. *Cad Saude Publica* 22: 1385-1396.
 19. Berquo E, Barbosa RM, Lima LP (2008) Trends in condom use: Brazil 1998 and 2005. *Rev Saude Publica* 42: 34-44.
 20. Camargo BV, Botelho LJ (2007) AIDS, sexuality and attitude of adolescents about protection against HIV. *Rev Saude Publica* 41: 61-68.
 21. Pereira GS, Borges CI (2010) Knowledge about HIV/AIDS in a group of elderly in Anápolis-Goiás. *Escola Anna Nery* 14: 720-725.
 22. <https://www.cmec.ca/docs/pcap/pcap2013/PCAP-2013-Highlights-EN.pdf>
 23. Alves RN, Kovacs MJ, Stall R, Paiva V (2002) Psychosocial aspects of HIV infection among women in Brazil. *Rev Saude Publica* 36: 32-39.
 24. de Souza CT, Bastos FI, Lowndes CM, Szwarcwald CL, dos Santos EM, et al. (1999) Perception of vulnerability to HIV infection in a cohort of homosexual/bisexual men in Rio de Janeiro, Brazil. *AIDS Care* 11: 567-579.
 25. Lazzarotto AR, Kramer AS, Hadrich M, Tonin M, Caputo P, et al. (2008) The knowledge of the aged about HIV/AIDS: Epidemiologic study in Vale do Rio dos Sinos, Rio Grande do Sul, Brazil. *Cien Saude Colet* 13: 1833-1840.
 26. Meneghin P (1996) Between the fear of HIV contamination and the symbolic representations of AIDS: The specter of contemporary despair. *Rev Esc Enferm USP* 30: 399-415.