Prevalence and factors associated with syphilis in a Reference Center

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Abstract

Introduction: The implementation of the rapid test (RT) for syphilis increases access of vulnerable populations to early diagnosis and treatment, impacting the outcomes of infection. We aimed to assess the prevalence of and factors associated with syphilis in a Center for Testing and Counseling (CTC). **Methods:** We conducted a cross-sectional study at a Reference Center for sexually transmitted disease (STD) and acquired immune deficiency syndrome in Londrina, Northern Paraná State, Southern Brazil. Data regarding the 5,509 individuals who underwent RT from June 2012 to December 2014 were collected from patient records and the CTC Information System and served as the basis to check associations of syphilis cases (346) and cases without syphilis (5,163). Nine patients' records were not found. OpenEpi was used to perform a prevalence analysis and determine odds ratios to assess the associations between sociodemographic and behavioral variables (independent variables) and cases of syphilis (dependent variable). An alpha value <0.05 was considered statistically significant. **Results:** The prevalence of syphilis was 6.3%; higher in males (7.5%) than in females (4.3%, p <0.001). Syphilis was associated with an age of 25-34 years, little education, and single marital status. The main associated behavioral factors were men who have sex with men, drug users, STD patients, and those presenting with an STD in the last year. The use of alcohol, marijuana, cocaine, and crack was significantly associated with syphilis. **Conclusions:** Strategies for prevention and control of syphilis should be intensified, especially in populations identified as most vulnerable.

Keywords: Syphilis. Prevalence. Serological tests.

INTRODUCTION

Syphilis is a major challenge to public health due to the significant increase in diagnosed cases. The World Health Organization (WHO) estimated that in 2010, there were eleven million new cases of syphilis per year worldwide[1]. In 2013, more than a million people acquired a sexually transmitted disease (STD) each day, and every year 500 million people contract a curable infection, including syphilis[2]. In Brazil, there are an estimated 937,000 new cases of STD per year[3,4].

Syphilis is caused by *Treponema pallidum*, a highly pathogenic bacterium[5]. In acquired syphilis, transmission occurs predominantly through sexual contact, mainly affecting the genital and anal area. In congenital syphilis, transmission takes place via the placenta or hematogenously from contact with fluids that contain the bacteria at any gestational stage and clinical stage of maternal disease[6].

There are two classifications of acquired syphilis. One, determined by the infection time, includes recent acquired syphilis (less than a year of infection) and late acquired syphilis (more than a year of infection). The other considers the clinical manifestations and the stages of infection, called primary, secondary and tertiary[4].

Most symptoms arise in the first two stages, which are considered the longest periods of exposure. The third stage may show no symptoms, giving a false impression of disease resolution, but the consequences may be present. Lasting about a year, the early phase includes the primary, secondary and early latent stages; the late phase is characterized by manifestations of tertiary syphilis[7].

In the context of vulnerability, investigators consider some populations as more likely to acquire syphilis: individuals living in seclusion, homeless people, drug users, men who have sex with men (MSM), those co-infected with human

immunodeficiency virus (HIV), and pregnant women[8-14].

The rapid test (RT), which is regulated by various ministerial orders[15-17], was instituted to fulfil the need for early diagnosis and treatment of syphilis. It was justified by the consequences that an untreated infection can cause both in pregnant women and in the general population or specific groups. The RT is an immunoassay (treponemal) for the detection of specific antibodies to *T. pallidum*. It can be performed with a whole blood sample, serum, or plasma and provides results within 30 minutes[18].

Given the above, this study aimed to analyze the prevalence of and factors associated with syphilis in a Center for Testing and Counseling (CTC).

METHODS

This was an observational, analytical, and cross-sectional study performed at the Reference Center (RC) for STD and acquired immune deficiency syndrome (AIDS), located in Londrina, Paraná State, Brazil. The RC has a testing and counseling center for carrying out RTs for syphilis and other STDs and a clinic for the care of positive cases of syphilis, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), and other STDs on behalf of the city and the state's 17th health region.

The analysis population consisted of 5,509 individuals who underwent rapid testing for syphilis in the period from June 2012 to December 2014.

The model adopted in this study followed the routine of the RC in which the initial diagnosis was made by RT (treponemal) and confirmed by the Venereal Disease Research Laboratory (VDRL) non-treponemal method, as shown in **Figure 1**.

Data were collected from the patients' records and the CTC Information System (SI-CTC) proposed by the Ministry of Health.

Considering the population of all individuals who underwent the test for syphilis, there was a prevalence of positive test of results for syphilis (0: yes, 1: no). Univariate and bivariate analyses were performed using OpenEpi software (version 3.03a), and the data is presented in tables.

Still considering the population of all individuals who underwent the test for syphilis, we performed analyses by crossing the variables associated (independent variables) with the presence of syphilis (dependent variable). In this phase, the chi-squared test of association and odds ratios (OR) with 95% confidence intervals (95% CI) were used. The significance level was set to 0.05.

Ethical considerations

This study was approved by the Research Ethics Committee of *Universidade Estadual de Londrina*, with CAAE number 35357914.0.0000.5231 in accordance with Resolution 466/2012 of the National Health Council[19].

RESULTS

During the study period, 5,509 RTs were performed, mostly in males (62.5%), those of white race (80.9%), 13-34-year-olds (55.6%), and those in informal relationships (67.3%; i.e., they were single, separated, or widowed). We observed a higher concentration of individuals who had three years of education or less (41.2%).

The overall prevalence of syphilis was 6.3%, higher in males (7.5%) than in females (4.3%), which was a statistically significant difference (p-value <0.001). In relation to age, the highest prevalence was observed in the group aged 25 to 34 years (7.4%, p <0.05) and 60 to 90 years (7%).

Regarding the race/color variable, the prevalence of syphilis was higher among non-whites (7.2%) than among whites (6.1%); however, this was not a statistically significant difference. Individuals of low education (0-3 years) had a prevalence of 7.7% compared to 4.4% among those whose education included 12 or more years of study (p <0.001). **Table 1** shows that **a** significantly higher prevalence rate was identified among individuals in an informal relationship (6.6%) than among those with a stable marital union status (5%).

The minimum age of patients with syphilis was 14 years (women) and the maximum was 90 (men) with a mean of 36.4 (SD = 14.44). The study showed the age of men with positive tests was younger than that of women (median, 31 years), with 50% of cases between the ages of 25 and 42 years. Among women, the median age was 37 years, with 50% of cases between 28 and 50 years. It was also observed that a considerable number of individuals above the third age group had a syphilis diagnosis. The sociodemographic variables that were associated with syphilis were male sex, age 25 to 34 years, few years of education, and informal relationships (**Table 1**).

Table 2 shows the prevalence of syphilis and the odds ratio according to population group. The prevalence was higher among patients with STD (26.1%), MSM (15.2%), and drug users (11.9%), and these groups were strongly associated with syphilis. By analyzing the use of drugs in the last 12 months among individuals with syphilis, we found a prevalence of 9.7%. It was observed that crack, nasally inhaled (*snorted*) cocaine, marijuana, and alcohol were strongly associated with a positive diagnosis of disease (**Table 3**).

The prevalence of syphilis was higher among individuals who had used a condom with a casual partner in the past 12 months, in their last relationship, and with their formal partner in their last relationship (p <0.05). It was also observed that the discontinuous use or non-use of a condom with regular partners in the last 12 months was associated with a higher prevalence than was continuous condom use; however, there was no statistically significant difference (p = 0.10). The presence of an STD in the last 12 months showed a strong association with infection by *Trypanosoma pallidum*, with a prevalence rate of 37.7% (**Table 4**).

DISCUSSION

The general prevalence (6.3%) of syphilis identified in this study showed a lower rate than that observed in a multicenter study conducted in 10 Brazilian cities. That study found a prevalence of 13.9%, with higher rates in Rio de Janeiro (23.5%) and Belo Horizonte (13.9%)[20]. A study conducted in
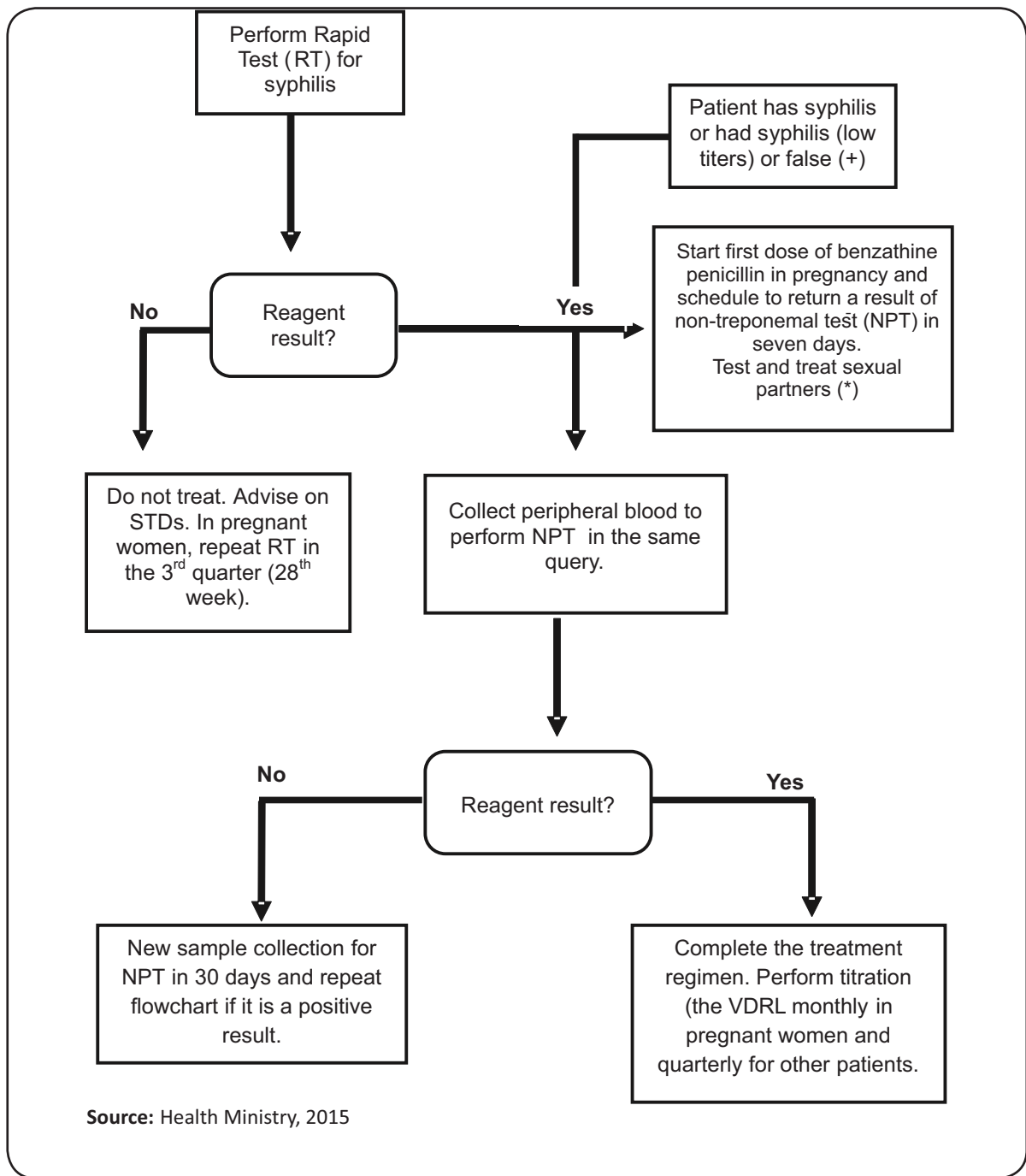
FIGURE 1 - Flowchart for the management of syphilis using a rapid test and non-treponemal confirmatory test. **RT:** rapid test; **NPT:** non-treponemal test; **STDs:** sexually transmitted disease; **VDRL:** venereal disease research laboratory. ***** Sexual partners with a positive RT should: 1) undergo NPT; 2) be treated for late latent syphilis in the absence of symptoms or clinical history of genital ulcer. The lack of treatment of sexual partners involves *inappropriate treatment of the mother*, and the conceptus will be considered to have congenital syphilis.

the São Paulo (Brazil) homeless population, which evaluated the prevalence of syphilis and associated factors using rapid testing in 1,405 individuals, revealed a prevalence of 7%[9]. Another study carried out in Angola, Africa among individuals attending a center of reference and testing for HIV showed higher positivity for syphilis (15%) among the 431 research subjects[21].

Analyzing the prevalence by sex, the results showed it was greater in men than in women, with a statistically significant difference. In a study whose aim was to examine cases of syphilis acquired, the authors found a higher prevalence in males (73.8%) and in those of sexually active age (58.9% of cases were between 20 and 39 years old)[20]. With regard to age, the present study found a higher prevalence among sexually

TABLE 1

Results of the rapid test for syphilis in individuals attending the Counseling and Testing Center, according to sociodemographic variables. Londrina, Paraná, State, 2012-2014.

Sociodemographic variables	Positive case of syphilis		Negative case of syphilis		p	OR (95% CI)
	total	%	total	%		
Gender (n = 5,509)						
female	88	4.3	1,980	95.7		Reference
male	258	7.5	3,183	92.5	<0.001	1.82 (1.42-2.34)
Age (n = 5,463)*						
0-12	0	0.0	35	100.0		-
13-24	69	4.8	1,368	95.2		Reference
25-34	118	7.4	1,485	92.6	0.003	1.57 (1.16-2.13)
35-44	65	6.4	957	93.6	0.09	1.35 (0.95-1.91)
45-54	42	5.9	664	94.1	0.26	1.25 (0.84-1.86)
55-59	12	5.5	207	94.5	0.65	1.15 (0.62-2.16)
60-90	31	7.0	410	93.0	0.07	1.49 (0.97-2.32)
Race/color (n = 5,502)*						
white	271	6.1	4,188	93.9		Reference
nonwhite	75	7.2	968	92.8	0.23	1.17 (0.89-1.53)
Education (years of study) (n = 5,493)*						
≥12	55	4.4	1,207	95.6		Reference
4 to 11	115	5.8	1,855	94.2	0.06	1.36 (0.98-1.89)
0 to 3	175	7.7	2,086	92.3	<0.001	1.84 (1.35-2.51)
Civil status (n = 5,505)						
stable relationship	90	5.0	1,710	95.0		Reference
informal relationship	243	6.6	3,462	93.4	0.01	1.33 (1.04-172)

OR: odds ratio; **95% CI:** confidence interval of 95%; *Some values ignored that were not applicable.

TABLE 2

Result of rapid test for syphilis in individuals followed at the Counseling and Testing Center, according to population group. Londrina, Paraná, State, 2012-2014.

Variables	Positive cases of syphilis		Negative cases of syphilis		P	OR (95% CI)
	total	%	total	%		
Population						
(n = 5509)						
general population*	113	2.8	3,939	97.2	<0.001	Reference
men who have sex with men*	107	15.2	595	84.8	<0.001	6.27 (4.74-8.28)
drug users*	35	11.9	259	88.1	<0.001	4.71 (3.16-7.02)
person with STDs*	36	26.1	102	73.9	0.004	12.3 (8.05-18.79)
others**	19	5.9	304	94.1	<0.001	2.18 (1.32-3.59)

OR: odds ratio; **95% CI:** confidence interval of 95%; **STDs:** sexually transmitted disease. *Some values ignored that were not applicable; **Women who have sex with women, bisexuals, syphilis carriers, and pregnant women.

TABLE 3

Results of rapid test for syphilis in individuals followed at the Counseling and Testing Center, according to variables related to the use of drugs.
Londrina, Paraná, State, 2012-2014.

Variables	Positive cases of syphilis		Negative cases of syphilis		p	OR (95% CI)
	total	%	total	%		
Use of drugs in the last 12 months						
no	186	4.7	3,745	95.3	<0.001	Reference
yes	151	9.7	1,410	90.3		2.16 (1.72-2.69)
Alcohol use						
have never used	182	4.5	3,873	95.5	<0.001	Reference
use/used	155	10.8	1,282	89.2		2.57 (2.06-3.22)
Marijuana use						
have never used	267	5.4	4,681	94.6	<0.001	Reference
use/used	70	12.9	474	87.1		2.59 (1.95-3.41)
Cocaine use (nasal inhalation)						
have never used	282	5.4	4,893	94.6	<0.001	Reference
use/used	55	17.4	262	82.6		3.64 (2.64-4.96)
Crack use						
have never used	292	5.5	4,993	94.5	<0.001	Reference
use/used	45	21.7	162	78.3		4.75 (3.32-6.71)

OR: odds ratio; **95% CI:** confidence interval of 95%.

TABLE 4

Results of the rapid test for syphilis in individuals followed at the Counseling and Testing Center, according to STD reporting in the last 12 months and
variables related to the use of condoms. Londrina, Paraná, State, 2012-2014.

Variables	Positive cases of syphilis		Negative cases of syphilis		p	OR (95% CI)
	total	%	total	%		
Condom use in the last 12 months with formal partner (n = 3,903)*						
regular use/ non-use	34	4.7	694	95.3	0.10	Reference
irregular use/non-use	198	6.2	2,977	93.8		1.36 (0.94-1.99)
Condom use at last relationship with formal partner (n = 3,125)*						
yes	46	11.1	367	88.9	0.001	Reference
no	174	6.4	2,538	93.6		0.55 (0.39-0.77)
Condom use in the last 12 months with eventual partner (n = 5,505)*						
regular use/ non-use	44	6.8	599	93.2	<0.001	Reference
irregular use/non-use	154	3.2	4,708	96.8		0.44 (0.32-0.63)
Condom use at last relationship with eventual partner (n = 1,863)*						
yes	53	11.3	414	88.7	0.04	Reference
no	114	8.2	1,282	91.8		0.69 (0.49-0.98)
DST in the last twelve months (n = 5,492)*						
no	174	3.4	4,896	96.6	<0.001	Reference
Yyes	159	37.7	263	62.3		17.66 (13.78-22.69)

***Some values ignored that were not applicable; OR:** odds ratio; **95% CI:** confidence interval of 95%.

active individuals between 25 and 34 years old, and this was statistically significant. However, our findings highlight the diagnosis of syphilis in patients in the extremes of age groups, i.e., those 14 to 90 years old.

The precocity of sexual initiation has been considered a risk factor for STDs. In a study of over one hundred thousand teenagers from public and private schools, 28.7% reported that they had sexual intercourse. This index reaches levels similar to other international surveys conducted by the WHO[22,23]. By contrast, the presence of syphilis has been observed both in old age as well as in both sexes in some studies[24,25]. The authors hypothesize that pharmaceutical innovations have prolonged the sexual life of individuals, causing an increase in promiscuity mainly in men[24,25].

Another relevant issue that is underscored in this study is that a low education level can interfere with the understanding of the guidelines for methods of prevention. This corroborates the results of research carried out in São Paulo and Recife, where the less educated had incorrect information on forms of prevention and contagion, reflected by a higher prevalence of STDs in this group[26]. It is understood that some questions of an educational nature may interfere with the adoption of methods of prevention, for example, low education may contribute to the increase of these infections. Considering that both syphilis and other STDs are transmitted predominantly through sexual contact, several aspects must be considered, including the level of understanding and self-care ability.

The analysis of the marital status corroborates the results of a study carried out in Cuba with 120 individuals who presented serologically positive for syphilis, in which 76.7% had no stable relationships. It is believed that subjects who have no fixed association tend to engage more partners and thus increase the possibility of acquiring STDs[27].

In relation to our population group, there was a statistically significant difference and strong association with syphilis among MSM, injecting drug users, and people with STDs. Our study also identified other groups: women who have sex with women, bisexuals, and women who were pregnant.

The population of MSM has been associated with an increased risk for STDs; the prevalence of syphilis shown in an international systematic review was 7.5%, much lower than that identified in this study[28]. A study conducted in Salvador showed the prevalence of syphilis in MSM was much higher (14%) than the general population of men (1.3%). Consequently, prevention and direct interventions for MSM should be carried out, including social policies aimed at improving their living conditions, reducing stigma, and facilitating closer ties with health services[13].

As for pregnant women, few sought out the CTC to perform the RT. This finding may be due to low usage of the RT in the Basic Health Units where prenatal care is performed. This argues for the need for strict testing for syphilis during pregnancy because when untreated, there are serious consequences for both the mother and the fetus or the newborn[29].

Sexually transmitted disease TDs and drug use reportedly show a strong association with syphilis. A study in Recife with

400 drug users assessed the risk factors and the prevalence of both syphilis and HIV in this population. It points out that most cases were men (71%) and young people in informal relationships who used crack (four days a week) and consumed multiple drugs. Half of these users had started using illegal drugs more than six years prior, including marijuana at a young age and before the age of 18[30]. Drug use among the young in association with early sexual initiation possibly enhances the vulnerability of young people to syphilis and other STDs[30].

Another survey of drug users in 10 Brazilian cities shows the influence of alcohol and drugs on vulnerability and exposure to HIV and other STDs, demonstrating their central role in the dynamics of the spread of HIV/AIDS and STDs. For this reason, it would be strategic to introduce the *Hazard Reduction Program* to reduce individual and collective damage[31]. In accordance with the findings of our research, another study shows that consumption of alcohol is a predictor for syphilis when compared to HIV and HBV. In addition, individuals who drink are more likely to have multiple sexual partners and less likely to use condoms consistently[32].

Studies demonstrate that a history of STDs is associated with syphilis, especially in the female population; in pregnant women, they have demonstrated high rates of STDs[33], and in female sex workers, the prevalence of STD was 71.6%. Among these cases, 4.05% were syphilis, with the highest associations found with Human Papiloma Virus (HPV) (67.7%) and chlamydia (20.5%) infections[34].

Some inconsistencies were found in this study regarding the association of syphilis with condom use in the previous twelve months with a casual partner and the last relationship with a fixed or casual partner. The authors have considered the possibility of failures in the CTC record, due to both the lack of understanding of users of the terminology and lack of standardization of recording of information by professionals, i.e. it was not clear what the health care professionals understood about *fixed* or *casual* partners.

In general, studies show that condom use prevents transmission of STDs when they are regularly used. A survey, which has studied the risk of HIV and STDs, showed that the reasons for using condoms still related more to reproduction control, the main concern of young people, than prevention of infectious diseases such as syphilis and HIV[26].

Another situation identified in the study was that young São Paulo residents with a high education level resorted to HIV testing as soon as they obtained some stability in a relationship, dispensing with the use of condoms in relations. Older men, especially those of Recife, reported they do not use condoms even in extramarital relationships. The term *trust* was present in the statements of both sexes, but with different connotations. For men, confidence in the partner (girlfriend, wife, or partner) meant sexual exclusivity. For women, trust in the partner (boyfriend, husband, or partner) did not mean fidelity or sexual exclusivity, but that the partner protected himself during extramarital relations.

Older women who said they did not use condoms because they are sheltered from risk due to the stability of the relationship

expressed concern about their children's use of condoms; the study also revealed that women refused to use condoms due to rejection by their partner[26]. In relation to adult women, especially the elderly, another study emphasizes their risk in terms of failing to negotiate safe sex in lasting relationships. Marriage is highlighted as a protective factor against disease. Love, loyalty, respect, trust, and complicity create a romantic vision and can lead to the abandonment of the use of condoms, believing they are protected[24,25]. It appears, therefore, that the use of condoms involves socio-cultural issues, which differ among genders, ages, and types of partnerships.

The same situation is observed among adolescents in an analysis of the influence of asymmetric gender relations that investigated female exposure to STDs and AIDS in northeastern Brazil. This study points to female adolescents' difficulties in negotiating the use of condoms with their partners. It was also verified that there is a lack of specific preventive health care actions directed to teenagers in several sectors of Brazil, specifically in families, schools, bars, clubs, and local health systems among others. This failure may generate repercussions in sexual and reproductive health throughout the course of life[35].

Another study revealed that of 438 individuals of both sexes, 326 (74.4%) mentioned that they had used condoms in the previous year and 112 (25.6%) said they sometimes or never used them over the same period of time[36]. The study also pointed out that despite the numerous educational guidelines, condom usage has not been incorporated into the sexual practices of individuals. The reason for this needs to be investigated through new studies.

In conclusion, our study aimed to identify the prevalence of syphilis and the associated risk factors in the population who underwent the rapid test for syphilis. The prevalence of disease was about 6.3% higher in males (7.5%) than in females (4.3%). It also identified that male sex, age between 25 and 34 years, few years of education, discontinuous use of condoms, MSM, and casual relationships were all associated with syphilis. Others factors related to cases of syphilis were the use of drugs in the previous twelve months, specifically crack, nasally inhaled cocaine, marijuana, and alcohol, and the presence of an STD.

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