Bio-behavioral survey of syphilis in homeless men in Central Brazil: a cross-sectional study

Um inquérito bio-comportamental sobre sífilis em homens sem-teto no Centro-oeste do Brasil: um estudo transversal

Cuestionario bioconductual sobre la sífilis en hombres sin techo en el Centro-oeste de Brasil: un estudio transversal

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Abstract

The objective of this study was to investigate the prevalence and factors associated with syphilis in homeless men in Central Brazil. It is a cross-sectional study conducted with 481 individuals attending four therapeutic communities between October and December 2015. A structured interview was conducted to collect sociodemographic data and risk factors for syphilis. Rapid/point-of-care and VDRL tests were performed to determine exposure to syphilis and the presence of active syphilis, respectively. Poisson regression analysis was used to verify the risk factors associated with the outcomes investigated. Of the study participants, 10.2% were reactive to the rapid test, and 5.4% had active syphilis. At the multiple regression analysis, schooling (adjusted prevalence ratio – APR: 0.89; p = 0.005), history of genital ulcer (APR: 2.59; p = 0.002), STI history (APR: 1.97; p = 0.042), and sexual intercourse under drug effects (APR: 1.60; p = 0.022) were independent factors associated with lifetime syphilis. Also, history of genital ulcer (APR: 2.19; p = 0.019), STI history (APR: 1.74; p = 0.033) and number of sexual partners in the last year (APR: 1.02; p = 0.044) were associated with active syphilis. The prevalence of syphilis among homeless men was rather high, confirming the vulnerability of this group to this infection. These results emphasize the need for educational intervention, improvement of risk reduction programs, availability of diagnostic tests, especially the rapid test, and treatment.

Syphilis; Homeless Persons; Risk Behavior

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Background

Syphilis is a major public health problem around the world. It is associated with several severe outcomes, including maternal-fetal complications, infertility, and death [1]. This infection is highly endemic in developing countries, and in recent decades it has considerably reemerged in several developed countries. The World Health Organization [2] estimated about 36.4 million prevalent cases of syphilis and an incidence of 10.6 million infections every year, of which 90% are concentrated in low- and middle-income countries. In the Americas, it is estimated that 6.7 million people are infected with *Treponema pallidum*, and that 2.8 million new cases of syphilis occur per year [3].

In particular, congenital syphilis is generally devastating worldwide, being associated with high morbidity and mortality [4]. In 2012, it was estimated that 350,000 adverse pregnancy outcomes were associated with syphilis, with 143,000 early fetal deaths/stillbirths, 62,000 neonatal deaths, 44,000 preterm/low birth weight babies and 102,000 infected infants [5]. In the Region of the Americas, approximately 22,800 cases of congenital syphilis were estimated in 2015 in 37 countries and territories [6]. In Brazil, despite the advances in congenital syphilis policies and interventions, the epidemic has worsened, resulting in substantial fetal and neonatal mortality [7]. In 2015, 19,228 cases of congenital syphilis in children under one year of age were recorded in the Notifiable Diseases Information System (SINAN, acronym in Portuguese), resulting in an incidence rate of 5.4/1,000 live births. Also, the infant mortality rate for syphilis has increased from 2.4/100,000 live births to 7.4/100,000 live births from 2005 to 2015 [8].

Syphilis has predominantly sexual transmission and less frequent parenteral and vertical transmission [9]. Thus, this infection is predominant among individuals with high risk behaviors, such as alcohol and illicit drug use, injection drug use, inconsistent condom use, multiple sexual partners, and sex for money and/or drugs [10,11]. In addition, investigations have shown that individuals with low income and education level and with difficulties of access to health services are more vulnerable to syphilis [12]. In this context, the infection is more common among certain key populations, such as individuals deprived of their liberty, illicit drug users, men who have sex with men, sex workers, and homeless persons [9].

Homeless populations represent one of the groups that is most affected by epidemics of sexually transmitted infections (STIs) including syphilis [13,14,15]. It is estimated that approximately 100 million people are homeless at the global level, and most are male [16]. Studies have shown a high frequency of risk behaviors among this population, such as consumption of psychoactive substances and inconsistent condom use [17,18,19,20]. In addition, they are more susceptible to social and environmental risk factors related to STIs when compared with the general population [13]. The few studies conducted with homeless men have shown syphilis prevalence from 4.4% to 6.9% [10,21].

In developing countries, such as Brazil, the real prevalence of syphilis in homeless men is still unknown. The only studies conducted in the country found prevalence ranging from 5.2 to 6.6% in this population [12,22]. However, these studies included residents of only one city (São Paulo, Southeast region). In this context, epidemiological studies on infections such as syphilis in homeless men are important tools for the knowledge on this disease in this population, providing subsidies for the planning and implementation of measures of prevention, control, and treatment of the infection. This study aimed to investigate the prevalence and factors associated with syphilis in homeless men in Central Brazil.

Methods

A cross-sectional study was conducted using a non-probabilistic sample of homeless men between August and November 2015. Participants were recruited in four therapeutic communities for homeless people in the cities of Aparecida de Goiânia, Anápolis and Cocalzinho, located in the Goiás State, Central region of Brazil. We included all homeless men aged 18 or over who attended the institutions during the study period. Individuals with psychotic outbreak, severe mental illness or apparent psychomotor agitation were excluded from the study. No financial incentive was given for participation in this study.

The sample needed to perform the study was 285, considering a 80% statistical power (β = 20%), 95% significance level (α = 0.05), 3.0 design effect used to increase the sample and obtain a narrower 95% confidence interval (95%CI) [23], and 6.6% [12] prevalence of active syphilis in homeless men. To achieve this value, 30% of eventual losses were added, totaling a minimum required sample of 370 homeless men.

Data were collected at the participating institutions by previously trained health professionals. After clarifying the objectives, methods, benefits and potential risks, all subjects who agreed to participate in the study answered a structured questionnaire about sociodemographic characteristics, psychoactive substance use, and risk factors for syphilis. The instrument was based on previously validated studies conducted on vulnerable populations and tested in a pilot study. After the interview, a digital puncture was performed for conducting the rapid/point-of-care test (treponemal test). Then, 5mL of blood were collected through venipuncture, to perform the venereal diseases research laboraty (VDRL) test (non-treponemal test). All participants received pre-test counseling.

In this investigation, two dependent variables were considered: (i) exposure to syphilis, defined as positive in the rapid test [24], and active syphilis, defined as positive in the rapid test and VRDL (any titre) [25]. The following independents variables were considered: age (years); education level (years), length of stay on the street (days); marital status (married/consensual vs. single/separated/widowed), family cohabitation (yes vs. no); tattoo (yes vs. no); body piercing (yes vs. no); previous blood transfusion (yes vs. no); alcohol use (yes vs. no); marijuana use (yes vs. no); crack use (yes vs. no); use of intranasal cocaine (yes vs. no); injecting drug use (yes vs. no); previous HIV testing (yes vs. no); history of urethral discharge (yes vs. no); history of genital ulcer (yes vs. no); STIs history (yes vs. no); condom use (always vs. sometimes/never); condom use in the last sexual intercourse (yes vs. no); alcohol use before and/or during sexual intercourse (always vs. sometimes/never); use of illicit drugs before and/or during sexual intercourse (always vs. sometimes/never); sexual intercourse with STI carriers (yes vs. no); sex with sex workers (yes vs. no); sexual relations with illicit drug users (yes vs. no); homosexual sexual relation (yes vs. no) and number of sexual partners. The consumption of psychoactive substances was measured for the last 30 days, except for injection drugs which were measured for the participant's lifetime. Sexual behavior information was restricted to the last year.

The data were analyzed using the statistical program Stata (StataCorp LP, College Station, USA) version 12.0. Initially, the quantitative variables were verified through the Anderson-Darling test [26]. Descriptive analysis of the variables was performed. The quantitative variables were presented as median and interquartile range (IQR) and the qualitative variables, as absolute and relative frequencies. Lifetime and active syphilis prevalence was estimated with 95%CI. Poisson regression with robust variance estimation [27,28] was used to analyze the independent contribution of each risk factor to the investigated outcomes. In the multivariable analysis, the inclusion criterion adopted was p-value < 0.20 in the bivariate analysis for potential confounders, and the variables which had significance lower than 0.05 remained in the final model. The multivariable analysis results are presented as adjusted prevalence ratio (APR) and with a respective 95%CI. Variables with values of p < 0.05 were considered statistically significant.

Ethical aspects

This study was approved by the Ethics Committee of the Federal University of Goiás' University Hospital, under number 1236774. Consent was obtained from all participants. The results of the rapid test were delivered to the participants, immediately after the post-test counseling. Next, they were referred to the health unit closest to the interview site for clinical follow-up and treatment.

Results

Characteristics of the participants

Of the total number of potentially eligible participants attending the institutions during the study period (n = 511), 481 agreed to participate (94.1% response rate). Table 1 summarizes the

Table 1

Sociodemographic characteristics, substance use, and risk behaviors of homeless men in Central Brazil.

Variables	n *	%
Age (years)	36 (29.0-45.0)	
Education (years) **	8.0 (6.0-11.0)	
Time spent on the streets (days)	90.0 (7.0-1,095.0)	
Marital status ***		
Married/Consensual union	65	13.7
Single/Separated/Widowed	411	86.3
Children **		
No	161	33.6
Yes	318	66.4
Living family ***		
Yes	318	66.8
No	158	33.2
Previous hospitalization ***		
No	151	31.5
Yes	328	68.5
Previous imprisonment		
No	144	29.9
Yes	337	70.1
Tattoo #		
No	269	56.0
Yes	211	44.0
Body piercing		
No	359	74.6
Yes	122	25.4
Previous hemotransfusion #		
No	408	85.0
Yes	72	15.0
Use of psychoactive substances ##		
Alcohol	358	74.9
Marijuana	181	37.9
Crack	254	53.1
Cocaine	182	38.1
Other substance	85	17.8
Injection drug use		
No	439	91.3
Yes	42	8.7
HIV testing		
No	401	83.4
Yes	80	16.6
STI history ###		
No	314	66.1
Yes	161	33.9
History of urethral discharge ###		
No	337	70.9
Yes	138	29.1
History of genital ulcer		
No	407	84.6
Yes	74	15.4

(continues)

Table 1 (continued)

Variables	n *	%
Condom use §		
Always	82	17.4
Sometimes/Never	390	82.6
Condom use in the last sexual intercourse **		
No	199	42.4
Yes	270	57.6
Alcohol use before or during intercourse #		
Always	51	10.6
Sometimes/Never	429	89.4
Drug use before or during intercourse ##		
Always	190	39.7
Sometimes/Never	288	60.3
Sexual intercourse with illicit drug users ###		
No	133	28.0
Yes	342	72.0
Sexual intercouse with sex workers #		
No	137	28.5
Yes	343	71.5
Homosexual sexual intercourse #		
No	336	70.0
Yes	144	30.0
Sexual intercourse with people with STI ***		
No	397	83.4
Yes	79	16.6
Number of sexual partners in the last year ***	2.0 (1.0-5.0)	

STI: sexually transmitted infection.

Note: quantitative variables presented as median and interquartile range (IQR).

* n = 481;

** Missing = 12;

*** Missing = 5;

Missing = 1;

Missing = 3;

Missing = 6;

§ Missing = 9.

sociodemographic characteristics, use of psychoactive substances, and risk behaviors reported by the study participants. The median age, education level and time spent homeless was 36 years (IQR: 29-45), eight years (IQR: 6-11), and 90 days (IQR: 7.0-1,095.0), respectively. Most of them were single/separated/widowed (86.3%) and had children (66.4%).

Lifetime use of psychoactive substances was reported by 97.7% of the homeless men. The participants reported consumption of alcohol (74.9%), marijuana (37.9%), crack (53.1%), intranasal cocaine (38.1%), and other substances (17.8%) in the previous 30 days. Overall, 8.7% of the participants reported injecting drug use; of them, 42.9% reported a history of sharing of drug use instruments. The median onset of drug use was 15 years (IQR: 13-18) (Table 1).

Antecedents of urethral discharge and genital ulcer were reported by 29.1% and 15.4% of the participants, respectively. STIs history was reported by 33.9% of the sample. Only 16.6% of the men reported previous HIV testing. Inconsistent condom use (sometimes/never) was reported by most participants (82.6%). Of the total, 89.4% and 60.3% reported use of alcohol and illicit drugs before and/or during sexual intercourse, respectively. In addition, 72% reported having had sex with illicit drug users; 71.5% with sex workers; 30% with people of the same sex; 16.6% with STI carriers. The median number of sexual partners in the last year was two (IQR: 1.0-5.0) (Table 1).

Syphilis prevalence

Overall, 49 men (10.2%; 95%CI: 7.8-13.2) were reactive to the rapid test, suggesting current or past infection (exposure to syphilis). Of these, 26 exhibited positive VDRL, resulting in a 5.4% prevalence of active syphilis (95%CI: 3.7-7.8).

Factors associated with syphilis

Table 2 shows the factors associated with exposure to and active syphilis in the bivariate Poisson analysis. History of genital ulcer (p = 0.010), and STIs history (p = 0.001) were predictors of exposure to syphilis in this analysis. Also, alcohol use (p = 0.016), crack use (p = 0.046), history of genital ulcer (p = 0.010) and STIs history (p = 0.008) were factors associated with active syphilis in this analysis.

Table 3 presents the results of the multiple regression model of factors associated with exposure to syphilis. Education level (APR: 0.89; p = 0.005), history of genital ulcer (APR: 2.59; p = 0.002), STIs history (APR: 1.97; p = 0.042), and use of illicit drugs before and/or during sexual intercourse (APR: 1.60; p = 0.022) were independent factors associated with this outcome. Table 4 presents the results of the multiple regression model of factors associated with active syphilis. The following factors were predictors of active syphilis: history of genital ulcer (APR: 2.19; p = 0.019), STIs history (APR: 1.74; p = 0.033), and number of sexual partners in the last year (APR: 1.02; p = 0.044).

Discussion

This study investigated the prevalence and factors associated with syphilis in homeless men in Central Brazil. Consistently with existing literature [10,22,29], the results of this research show high rates of risk behavior, including use of alcohol and/or illicit drugs, multiple sexual partners, inconsistent use of condoms, sexual practices under the influence of alcohol, and/or illicit drugs, and with groups (illicit drug users, sex workers and STI carriers). In addition, a high prevalence of syphilis was observed in the study population, and an association was found with important predictors (low education level, number of sexual partners, sexual intercourse under illicit drug use, history of STI, and genital ulcer). These results suggest a high vulnerability of homeless men to syphilis in Brazil, and the potential risk of acquiring other STIs, including infection by HIV.

The prevalence of active syphilis found in this study (5.4%; 95%CI: 3.7-7.8) was higher than that reported in industrial workers (1.9%; 95%CI: 1.5-2.5) [30], and Brazilian conscripts (0.5%; 95%CI: 0.45-0.61) [31], confirming the vulnerability of homeless men to this infection. These rateswere similar to those found in studies conducted with homeless men in the city of São Paulo. Brito et al. [22] estimated 5.2% prevalence (95%CI: 3.1- 8.6) among 267 individuals recruited at night shelters. Pinto et al. [12] found a 6.6% frequency of active syphilis (95%CI: 5.3-8.2) among 1,194 men assisted in social support services.

In the multivariable analysis, low education level, sexual intercourse under effects of illicit drugs and history of genital ulcer and STIs history were variables associated with exposure to syphilis. Moreover, history of genital ulcer, STIs history, and number of sexual partners were predictors of active syphilis. These factors have also been associated with syphilis in studies previously conducted with vulnerable populations in Brazil and in other countries [12,32,33].

In this study, the prevalence of exposure to syphilis decreased by 11% for each year of formal education. In fact, structural factors (e.g., low income and educaton level) are related to the increased risk acquisition of STIs in several key populations, including homeless men [34,35]. Some evidence suggests that low education level, used as a proximal socioeconomic variable, is associated with higher prevalence of certain STIs, involvement in high-risk behaviors (e.g., inconsistent condom use), low level of knowledge on preventive methods and access to health services and protection [36,37], which explains the relationship between this factor and infection by *T. pallidum*.

Our results show a high frequency of sexual intercourse under effects of illicit drugs in the study sample (60.3%), which is associated with exposure to syphilis. Also, many participants reported the use of substances such as crack, cocaine, and marijuana, and three-quarters of the men reported

Table 2

Bivariate analysis of factors associated with lifetime and active syphilis in homeless men in Central Brazil.

Variables	Lifetime syphilis				Active syphilis			
	Positive	%	PR (95%CI)	p-value *	Positive	%	PR (95%CI)	p-value *
Age (years)	39.0 (32.0-44.0)		1.01 (0.99-1.04)	0.203	35.0 (29.0-45.0)		0.99 (0.95-1.0)	0.604
Education (years)	9.0 (6.0-11.0)		0.93 (0.86-1.01)	0.106	9.0 (7.0-10.0)		1.07 (0.96-1.2)	0.205
Time spent on the streets (days)	90.0 (7.0-730.0)		1.01 (0.99-1.04)	0.198	90.0 (37.5-2,098.7)		1.02 (0.99-1.1) ***	0.169
Marital status								
Married/Consensual union	8	12.3	1.00		5	7.7	1.00	
Single/Separated/Widowed	41	10.0	0.81 (0.38-1.72)	0.587	21	5.1	0.66 (0.3-1.87)	0.417
Living family								
Yes	33	10.4	1.00		20	6.3	1.00	
No	16	10.1	0.97 (0.53-1.77)	0.936	6	3.8	0.60 (0.2-1.5)	0.281
Tattoo								
No	24	8.9	1.00		12	4.5	1.00	
Yes	25	11.8	1.34 (0.76-2.34)	0.305	14	6.7	1.50 (0.69-3.24)	0.301
Body piercing								
No	37	10.3	1.00		19	5.3	1.00	
Yes	12	9.8	0.95 (0.50-1.84)	0.901	7	5.8	1.09 (0.45-2.59)	0.845
Previous hemotransfusion								
No	38	9.4	1.00		20	4.9	1.00	
Yes	11	15.3	1.63 (0.83-3.19)	0.152	6	8.3	1.69 (0.67-4.21)	0.259
Alcohol use								
No	17	14.3	1.00		12	10.1	1.00	
Yes	32	8.9	0.62 (0.34-1.12)	0.120	14	3.9	0.38 (0.17-0.84)	0.016
Marijuana use								
No	31	10.4	1.00		17	5.7	1.00	
Yes	18	9.9	0.95 (0.53-1.70)	0.876	9	5.0	0.87 (0.38-1.95)	0.737
Crack use								
No	20	8.9	1.00		7	3.1	1.00	
Yes	29	11.4	1.28 (0.72-2.27)	0.383	19	7.5	2.41 (1.01-5.73)	**0.046**
Cocaine use								
No	30	10.1	1.00		13	4.4	1.00	
Yes	19	10.4	1.03 (0.58-1.83)	0.914	13	7.7	1.62 (0.75-3.51)	0.213
Injection drug use								
No	46	10.5	1.00		23	5.3	1.00	
Yes	3	7.1	0.67 (0.21-2.28)	0.515	3	7.1	1.35 (0.40-4.51)	0.619
HIV testing								
No	39	9.7	1.00		21	5.3	1.00	
Yes	10	12.5	1.27 (0.63-2.56)	0.488	5	6.3	1.18 (0.44-3.14)	0.730
History of urethral discharge								
No	31	9.2	1.00		19	5.6	1.00	
Yes	18	13.0	0.89 (0.37-2.14)	0.811	7	5.1	0.89 (0.37-2.14)	0.811
History of genital ulcer								
No	33	8.1	1.00		17	4.2	1.00	
Yes	16	21.6	2.91 (1.29-6.53)	**0.010**	9	12.2	2.91 (1.29-6.53)	**0.010**
STI history								
No	20	6.4	1.00		10	3.2	1.00	
Yes	27	16.8	2.66 (1.49-4.75)	**0.001**	15	9.4	2.96 (1.33-6.59)	**0.008**
Condom use								
Always	12	14.6	1.00		7	8.5	1.00	
Sometimes/Never	36	9.3	0.63 (0.32-1.21)	0.172	18	4.6	0.54 (0.22-1.30)	0.171
Condom use in the last sexual intercourse								
No	15	7.5	1.00		8	4.7	1.00	
Yes	32	11.9	1.57 (0.85-2.90)	0.148	17	6.3	1.56 (0.67-3.62)	0.295

(continues)

Table 2 (continued)

Variables	Lifetime syphilis				Active syphilis			
	Positive	%	PR (95%CI)	p-value *	Positive	%	PR (95%CI)	p-value *
Alcohol use before or during sexual intercourse								
Always	8	15.7	1.00		3	5.9	1.00	
Sometimes/Never	41	9.6	0.78 (0.52-1.18)	0.252	23	5.4	0.67 (0.38-1.18)	0.170
Drug use before or during sexual intercourse								
Always	17	8.9	1.00		6	3.2	1.00	
Sometimes/Never	32	11.1	1.25 (0.89-1.76)	0.190	20	7.0	1.48 (0.92-2.37)	0.101
Sexual intercourse with people with STIs								
No	40	10.1	1.00		21	5.3	1.00	
Yes	9	11.4	1.14 (0.55-2.35)	0.718	5	6.4	1.20 (0.45-3.20)	0.703
Sexual intercourse with sex workers								
No	14	10.2	1.00		5	3.7	1.00	
Yes	35	10.2	0.99 (0.53-1..84)	0.985	21	6.1	1.67 (0.62-4.42)	0.303
Sexual intercourse with illicit drug users								
No	11	8.3	1.00		5	3.8	1.00	
Yes	38	11.1	1.35 (0.69-2.64)	0.379	21	6.2	1.64 (0.61-4.35)	0.318
Homosexual sexual intercourse								
No	32	9.5	1.00		16	4.8	1.00	
Yes	17	11.8	1.24 (0.69-2.24)	0.466	10	7.0	1.46 (0.66-3.22)	0.344
Number of sexual partners in the last year	2.0 (1.0-4.0)		1.01 (0.98-1.04)	0.277	3.5 (1.25-10.0)		1.02 (0.99-1.1)	0.122

95%CI: 95% confidence interval; PR: prevalence ratio; STI: sexually transmitted infection.

Note: quantitative variables presented as medians and interquartile range (IQR).

* Wald chi-square test;

** PR calculated for every 30 days of stay on the street.

Table 3

Multiple regression of factors associated with lifetime syphilis in homeless men in Central Brazil.

Variables	Adjusted PR * (95%CI)	p-value **
Age (years)	1.02 (0.99-1.06)	0.114
Education (years)	0.89 (0.82-0.96)	**0.005**
Number of sexual partners	1.01 (0.99-1.03)	0.248
Condom use	0.64 (0.32-1.25)	0.197
History of genital ulcer	2.59 (1.43-4.72)	**0.002**
STI history	1.97 (1.02-3.79)	**0.042**
Previous hemotransfusion	1.73 (0.86-3.45)	0.119
Drug use before and/or during sexual intercourse	1.60 (1.06-2.41)	**0.022**
Alcohol use	0.50 (0.27-1.25)	0.198

95%CI: 95% confidence interval; PR: prevalence ratio; STI: sexually transmitted infection.

* Adjusted for all variables with p-value < 0.20 in the bivariate analysis;

** Wald chi-square test.

Table 4

Multiple regression of factors associated with active syphilis in homeless men in Central Brazil.

Variables	Adjusted PR * (95%CI)	p-value **
Age (years)	1.02 (0.97-1.07)	0.412
Education (years)	1.05 (0.94-1.16)	0.335
Number of sexual partners	1.02 (1.01-1.05)	**0.044**
Condom use	0.52 (0.18-1.44)	0.210
History of genital ulcer	2.69 (1.17-6.17)	**0.019**
STI history	1.74 (1.08-6.94)	**0.033**
Alcohol use before and/or during sexual intercourse	0.79 (0.47-1.31)	0.372
Drug use before and/or during sexual intercourse	1.42 (0.68-2.96)	0.337
Alcohol use	0.47 (0.19-1.19)	0.113
Crack use	2.10 (0.51-8.70)	0.303

95%CI: 95% confidence interval; PR: prevalence ratio; STI: sexually transmitted infection.

* Adjusted for all variables with p-value < 0.20 in the bivariate analysis;

** Wald chi-square test.

alcohol consumption. There is a strong relationship between the use of alcohol and/or illicit drugs and STIs [25,38]. Consumption of alcohol and illicit drugs lowers the perception of risk, reduces the user's ability to convince their partner to use a condom, and induces other risk behaviors (eg., sex for money and/or drugs and number of sexual partners), increasing the risk of acquiring syphilis and other STIs [39,40]. In this context, strengthening harm reduction strategies could contribute to reduce the burden of syphilis in homeless men [12].

Approximately one-third of the homeless men reported a history of medical diagnosis of STIs, and 15.4% reported a history of genital ulcer. These variables were predictors of exposure to and active syphilis. The presence of STIs, especially ulcerative infections, increases the chance of transmission and acquisition of HIV [18]. Ulcerative lesions facilitate the virus' access to cells under the epithelial surface and contact with blood, increasing the likelihood of systemic HIV infection [41]. It is estimated that the risk of HIV infection through sexual intercourse is increased 3-5 times in individuals infected with *T. pallidum* [42].

This study has some limitations. The cross-sectional nature of the study design does not allow the establishment of a cause and effect relationship between syphilis and the variables investigated [33]. Longitudinal studies should be implemented to verify the risk or protective factors associated with syphilis in homeless men. The non-probabilistic sample used in the investigation and the inclusion of individuals attending therapeutic communities limits the generalization of the results to the population of homeless men from other localities in Brazil [29]. Individuals treated in therapeutic communities may have different risk behaviors when compared to men with no link to these services [43]. However, the sociodemographic characteristics of the study participants were similar to other studies conducted in Brazil [12,22,29]. Data related to risk factors were self-reported, liable to memory and response bias, especially due to the nature of the interview (face-to-face). Finally, potential false negative results due to the effect of prozone in the VDRL test are considered, and the positive results in the treponemal and non-treponemal tests may not necessarily indicate active syphilis, as there are possibilities of false-positive reactions. Despite the limitations, the results of this study add important information on the epidemiology of syphilis in homeless men in Brazil, indicating the need to control this infection and for educational actions focused on this population.

In conclusion, the results of this study show a high prevalence of syphilis among the homeless men investigated, confirming the vulnerability of this population to this infection. The participants reported multiple risk behaviors for STI, suggesting continued risk and potential dissemination of syphilis among their social networks. The high prevalence of syphilis and risk behaviors found in this study indicates the urgent need for the introduction of effective prevention measures. Despite the

wide availability of diagnostic methods and simple treatment, syphilis still represents a major issue for homeless men in Central Brazil. The results of this study provide important data for the development of prevention strategies against syphilis and other STIs among homeless men, including the need for educational actions in services for homeless people, improvement of risk reduction programs, and availability of diagnostic tests, especially rapid tests and treatment of positive cases. Finally, further studies with homeless men in Brazil are needed to verify the true prevalence of the infection in other geographic locations.

Contributors

C. V. L. Barros contributed in the conception and design, acquisition of data, interpretation of results, drafting and approval of the final version for publication. H. Galdino Júnior participated in the Iinterpretation of results, drafting and approval of the final version for publication. G. Rezza participated on the interpretation of results, drafting, critical revision of the intellectual content and approval of the final version for publication. R. A. Guimarães contributed in the analysis of data, interpretation of results, drafting and approval of the final version for publication. P. M. Ferreira participated in the conception and design, acquisition of data, drafting and approval of the final version for publication. C. M. Souza, L. C. C. Guimarães and D. A. C. Barros contributed in the acquisition of data, drafting and approval of the final version for publication. S. M. Brunini contributed in the conception and design; acquisition of data; interpretation of results; drafting; critical revision of the intellectual content; approval of the final version for publication

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Resumo

O estudo teve como objetivo investigar a prevalência da sífilis e fatores associados em homens sem-teto no Centro-oeste do Brasil. A amostra nesse estudo transversal incluiu 481 indivíduos que frequentavam comunidades terapêuticas entre outubro e dezembro de 2015. Uma entrevista estruturada foi usada para coletar dados sociodemográficos e fatores de risco para sífilis. Foram realizados testes rápidos e VDRL para determinar a exposição à sífilis e a presença de sífilis ativa, respectivamente. A análise de regressão de Poisson foi usada para verificar os fatores de risco associados aos desfechos investigados. Entre os participantes, 10,2% foram reativos ao teste rápido e 5,4% tinham sífilis ativa. Na análise de regressão múltipla, a escolaridade (razão de prevalência ajustada – RPA: 0,89; p = 0,005), história de úlcera genital (RPA: 2,59; p = 0,002), história de DST (RPA: 1,97; p = 0,042) e relações sexuais sob o efeito de drogas (RPA: 1,60; p = 0,022) apareceram como fatores independentes associados à história pregressa de sífilis. Além disso, a história de úlcera genital (RPA: 2,19; p = 0,019), história de DST (RPA: 1,74; p = 0,033) e número de parceiros sexuais no último ano (RPA: 1,02; p = 0,044) estiveram associados à sífilis ativa. A prevalência de sífilis em homens sem-teto era bastante elevada, confirmando a vulnerabilidade desse grupo à infecção. Os achados enfatizam a necessidade de intervenções educacionais, melhoria dos programas de redução de risco, disponibilidade de testes diagnósticos (sobretudo o teste rápido) e tratamento adequado.

Sífilis; Pessoas em Situação de Rua; Comportamento de Risco

Resumen

El objetivo de este estudio fue investigar la prevalencia y los factores asociados con la sífilis en hombres sin techo en el Centro-oeste de Brasil. Se trata de un estudio transversal, llevado a cabo con 481 personas que asistían a cuatro comunidades terapéuticas entre octubre y diciembre de 2015. La entrevista estructurada se realizó con el fin de recabar datos sociodemográficos y factores de riesgo para la sífilis. Se realizaron pruebas de diagnóstico rápido y serológicas para la sífilis (VDRL por sus siglas en inglés) para determinar la exposición a la sífilis y la presencia de sífilis activa, respectivamente. Se usó el análisis por regresión de Poisson para verificar los factores de riesgo asociados con los resultados investigados. Entre los participantes en el estudio, un 10,2% fueron reactivos a las pruebas de diagnóstico rápido, y un 5,4% tenían sífilis activa. En el análisis de regresión múltiple, la escolarización (la razón de prevalencia ajustada – APR: 0,89; p = 0,005), un historial de úlcera genital (APR: 2,59; p = 0,002), un historial de ETS (APR: 1,97; p = 0,042), e intercambios sexuales bajo los efectos de las drogas (APR: 1,60; p = 0,022) fueron factores independientes asociados con la sífilis a lo largo de la vida. Asimismo, un historial de úlcera genital (APR: 2,19; p = 0,019), un historial de ETS (APR: 1,74; p = 0,033) y el número de parejas de índole sexual en el último año (APR: 1,02; p = 0,044) estuvieron asociados con sífilis activa. La prevalencia de sífilis entre los hombres sin techo fue bastante alta, confirmando la vulnerabilidad de este grupo a la infección. Estos resultados enfatizan la necesidad de intervenciones educativas, así como una mejora en los programas de reducción del riesgo, disponibilidad de pruebas de diagnóstico, especialmente pruebas rápidas, y tratamiento.

Sífilis; Personas Sin Hogar; Conducta de Riesgo