Factors associated with *Chlamydia trachomatis* infection in women resident in the state of Roraima, Brazil

Fatores associados à infecção por Chlamydia trachomatis em mulheres residentes no estado de Roraima, Brasil

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ABSTRACT

Introduction: *Chlamydia trachomatis* is an obligate intracellular bacterium. The genital infection caused by this bacterium is considered the most common sexually transmitted bacterial disease in the world. However, despite the magnitude of the problem, the state of Roraima does not address studies that establish its prevalence in the female population. **Objective:** To determine the prevalence of genital *C. trachomatis* in women living in Roraima and to evaluate the correlation of results with sexual behavior. **Methods:** A descriptive, cross-sectional and quantitative study involved 273 sexually active women, aged 18–60, resident in Roraima. In the beginning, 273 endocervical samples were collected through speculum examination in order to carry out the direct immunofluorescence test for *C. trachomatis*. In addition to laboratory tests for the detection of *C. trachomatis*, a survey was conducted through a clinical-epidemiological questionnaire, which determined the sociocultural and sexual profile of each participant. **Results:** The prevalence of *C. trachomatis* infection was determined in 33.73%. Association between *C. trachomatis* infection and women who have a family income greater than five minimum wages was also observed. Besides, chlamydial infection was connected with pain and bleeding during intercourse. The link between *C. trachomatis* infection and anal sex was demonstrated as well. Having a partner who works or had worked in mining and more than one sexual partner was pointed as a risk factor. **Conclusion:** The results indicate the high prevalence of *C. trachomatis* infection among the studied population, and factors such as practice of anal sex and having as a sexual partner someone who works or had worked in mining were pointed as associated with the infection.
Keywords: *Chlamydia trachomatis*; epidemiology; sexually transmitted disease; Brazil.

RESUMO

Introdução: A *Chlamydia trachomatis* consiste em uma bactéria intracelular obrigatória. A infecção genital causada por ela é considerada a doença bacteriana sexualmente transmissível mais comum no mundo. Todavia, apesar da magnitude do problema, Roraima não apresenta estudos que estabeleçam sua prevalência na população feminina. **Objetivo:** Determinar a prevalência da infecção genital por *C. trachomatis* em mulheres residentes em Roraima e avaliar a correlação dos resultados com possíveis fatores associados. **Métodos:** Estudo descritivo, transversal e de caráter quantitativo envolveu 273 mulheres sexualmente ativas com idades variando entre 18 e 60 anos residentes no estado de Roraima. Foram colhidas 273 amostras endocervicais por intermédio de exame especular para a realização do teste de imunofluorescência direta para *C. trachomatis*. Foi aplicado a cada participante um questionário clínico-epidemiológico que traçou o perfil sociocultural e sexual dos integrantes da pesquisa. **Resultados:** A prevalência da infecção por *C. trachomatis* foi de 33,73%. Foi demonstrada associação para a infecção por *C. trachomatis* em mulheres que possuem renda familiar mensal maior que cinco salários-mínimos. Houve ligação da infecção por clamídia com as variáveis dor e sangramento durante o ato sexual. Foi evidenciada relação entre a infecção por *C. trachomatis* e a prática do sexo anal. Ter um parceiro que trabalha ou trabalhou no garimpo foi apontado como fator de risco. Por fim, este estudo demonstrou associação para a infecção por *C. trachomatis* em mulheres que possuem mais de um parceiro sexual. **Conclusão:** Os resultados indicam a alta prevalência de infecção por *C. trachomatis* entre a população estudada. Fatores como a prática do sexo anal e possuir como parceiro sexual alguém que trabalha ou já trabalhou em garimpo foram apontados como associados à infecção.
Palavras-chave: *Chlamydia trachomatis*; epidemiologia; doença sexualmente transmissível; Brasil.

INTRODUCTION

Chlamydia trachomatis is an obligate intracellular bacterium not often producing symptoms and whose D and K serotypes are responsible for urogenital sexually transmitted infections[1,2]. The genital infection caused by this bacterium is the leading sexually transmitted bacterial infection[3]. According to the World Health Organization (WHO), around 50 million new cases are diagnosed every year in all continents[4]. Infection with *C. trachomatis* represents the highest proportion among all curable sexually transmitted diseases (STDs). It is frequent the detection of women with tubal damage, sometimes irreversible, provoked by this agent, determining permanent infertility[5]. If the infection with this pathogen is neither diagnosed nor treated in time, it can progress and cause pelvic inflammatory disease, chronic pelvic pain, and infertility[6].

The age would be one of the risk factors, and the most susceptible people are the younger individuals aged between 20 and 25 years, probably due to a greater sexual activity or number of partners[7]. The prevalence of the infection between adolescent and young adults in the 14 to 24 age group is four times higher than the prevalence between those ones in the 25 to 39 age group. Data from the National Coordination of STD/AIDS (Coordenação Nacional de DST/AIDS) indicate that almost two million new cases occur annually in Brazil[8].

Estimates indicate more than 10 million new sexually transmitted infections occurrence in Brazil, which can progress to symptomatic and asymptomatic disease[9]. Such incidence becomes worrisome if we consider that the population living in the state of Roraima, located in far Northern Brazil, in the Amazon region, deals routinely with poverty and sexual contact with people from bordering countries, such as British Guiana and Venezuela. Many women living in Roraima are tricked into working in mines of neighboring countries, driving

them to prostitution. However, when such women are infected with STD in those mines, they return to Brazil to be treated by the Public Health System (Sistema Único de Saúde — SUS), or in some cases they do not even look for treatment, becoming thus a potential vehicle for transmission of diseases[10].

Despite the magnitude of the problem, in Brazil the epidemiological behavior of this infection is not accurately known, since cervicitis and urethritis are not notifiable diseases, and most public services have no laboratory tests for the diagnosis[11]. In Roraima, the existing data are scarce and often unreliable due to underreporting caused mainly by the often asymptomatic *Chlamydia* infection and the difficulty for women from the interior of the municipalities to access the state health services.

OBJECTIVE

Determine the prevalence of genital infection with *C. trachomatis* in women resident in the state of Roraima and evaluate the results correlation between eventual associated factors.

METHODS

This research has been characterized as a descriptive, cross-sectional and quantitative study and involved 273 sexually active women, conducted to the Reference Center of Women's Health (Centro de Referência de Saúde da Mulher), in the city of Boa Vista, Roraima, for preventive examination of cervical cancer, aged between 18 and 60 years and resident in Roraima. In addition to the samples collection for the direct immunofluorescence (DIF) testing for the detection of *C. Trachomatis*, a semi-structured questionnaire was also applied, and it traced the sociocultural and sexual profile of the participants. Samples and data collections were made between April, 2014, and July, 2015. Collections occurred in the Reference Center of Women's Health, a public health institution that is reference in Roraima.

Endocervical samples were collected through specular examination of each participant for the detection of *C. trachomatis* and fixed with methanol on specific blades. Blades were conditioned and maintained at -20°C until they were transported to the Bacteriology Section of the Instituto Evandro Chagas (IEC), in the city of Ananindeua, state of Pará, Brazil.

The tests for DIF were carried out in the IEC. This method is based on the direct detection of the antigen in cells or tissues, intracellular or membranous, using a specific marked antibody. The DIF test used consists of monoclonal antibodies tagged with immunofluorescence (DFA Chlamydia Fluorect®-Omega Diagnostics), a method employed in laboratories for *C. trachomatis* diagnosis, mainly because of its lower cost when compared to other methods. This method applied in endocervical clinical specimens allows a diagnosis in approximately 30 minutes, and it is extremely valuable to the diagnosis and the epidemiological control of urogenital infection with *C. trachomatis*[12].

From the total of 273 collected samples, 18 were excluded, as they presented a number below 100 cells in the blades' smears for DIF, or had excessive mucus or blood, which would endanger the accomplishment of the test.

Descriptive analyses were carried out for the interpretation of the data collected through the clinical-epidemiological questionnaire including average with standard deviation for quantitative variables of parametric nature. The comparison between the samples' averages was performed by Student T test, since the equivalence of sampling variances is ensured. Otherwise, the Mann-Whitney test was used. The Chi-square test was used for comparison between proportions. The estimate of the variable association quantification was performed through *odds ratio* for a confidence interval of 95% (CI 95%) (Newcombe-Wilson method). The significant variables in univariate analysis were reviewed in a multivariate analysis (logistic regression method) to obtain the adjusted and independent *odds ratio*. The statistical program used was the Epi Info 7 (CDC, Atlanta, United States), settling the level of 5% for rejection of the null hypothesis.

With respect to ethical criteria, this research was evaluated and approved by the Ethics Committee of the Universidade Federal de Roraima (UFRR), through the co-corroborated opinion nº 408.996.

RESULTS

The prevalence of infection with *C. trachomatis* in the group evaluated in the state of Roraima, of 255 research participants, was 33.73%. The social and demographic characteristics of the participants of the study are described in **Table 1**.

Among the 255 research participants, 127 were in the 40–60 age group (49.81%), 76 in the 29–39 age group (29.80%), and 52 in the 18–28 age group (20.39%). The most prevalent age group for infection for *C. trachomatis* was the 29–39 years one (43.05%), followed by 40–60 (31.00%), and the lowest prevalence in the 18–28 age group (25,95%).

The relationship between race/color and infection with *C. trachomatis* showed a small difference between the mestiza and the white women: the first group, 37.50%, and the second group, 37.14%. Among black women, the prevalence was of 33.33%, while the brown women, despite representing the largest group, presented the lowest prevalence (32.99%).

Marital status related positive result for *C. trachomatis* infection pointed out that the prevalence was highest among the group of single women (39.28%), and followed by married women, which were grouped along with the group who reported living a common-law marriage (30.37%). Widows had the lowest prevalence (16.66%).

With regard to education, a single participant has a postgraduate degree (0.39%), and had a positive result for *C. trachomatis*, but as it is a sample of a single element, this result may not be statistically relevant. The highest prevalence of *C. trachomatis* infection was among those women with incomplete elementary school (47.91%), followed by those ones who not completed high school (44.44%), have incomplete college degree (38.46%), complete high school (33.33%), college degree (31.25%) and complete elementary school (20.00%).

Finally, the analysis of the monthly income exhibited that the highest prevalence occurred between the group of women with monthly family income exceeding five minimum wages (41.17%), followed by the group with the income of four or five wages (37.09%) and two or three minimum wages (32.37%). The lowest prevalence, 29.73%, was found in the group that owns the lowest income up to a monthly minimum wage.

As described in **Table 2**, the Chi-square test (significance level p<0.05) only demonstrated a statistically significant association between the positive result for *C. trachomatis* and the family income variable (p=0.001). Through the analysis of Chi-square residues, it was possible to identify that the monthly family income exceeding five minimum wages would be associated with infection with *C. trachomatis* in the sample under study. No association was observed between age group (p=0.129), marital status (p=0.198), education (p=0.150), place of residence (p=0.852) and race/color (p=0.963).

Regarding the number of sexual partners, 36 women (14.11%) did not have any sexual partner at the time of the research, 199 (78.00%) had only one, and 20 women (7.89%) had more than one sexual partner. The highest prevalence of infection with *C. trachomatis* is the group of women who had more than one partner (70.00%), followed

by those ones with only one (32.16%). The lowest prevalence was verified among women who did not have any sexual partner (28.57%).

About the use of condoms during intercourse, of 254 women who answered this question, 238 declared not using a condom during intercourse (93.70%) and 16 reported the use of condom during sex (6.30%). The prevalence of *C. trachomatis* infection among women who do not use condoms during sex is of 33.61%. Those ones who claimed to use it showed prevalence of 37.51%.

Among women who answered this question, 215 (84.31%) reported never having worked in mining, while 40 (15.69%) work or had worked in it. The group of those ones who never worked in mining presented 29.76% prevalence for *C. trachomatis* infection, and the group who reported working or having worked in minings presented a much higher prevalence, of approximately 55%.

Relating to the existence of a relationship between infection with *C. trachomatis* and the fact that women have a sex partner who works or had worked in mining, 166 women (65.09%) reported have never had sex with such a partner, while 89 women (34.91%) reported had lived this experience. The prevalence of infection with *C. trachomatis* among women who have never had intercourse with people who work or have worked in mining was of 21.68%, and the prevalence of those ones whose answer was yes was of 56.18%.

Table 1 – Sociodemographic profile of women living in Roraima, Brazil, who participated in the research from 2014 to 2015.

Explanatory variables	n	%
City of residence		
Amajari	2	0.78
Boa Vista	215	84.31
Bonfim	4	1.57
Cantá	9	3.58
Caracaraí	4	1.56
Mucaja	4	1.56
Normandia	1	0.39
Pacaraima	5	1.96
Rorainópolis	3	1.17
São João da Baliza	3	1.17
São Luiz do Anauá	2	0.78
Uiramutã	3	1.17
Age group (years old)		
18–28	52	20.39
29–39	76	29.80
40–60	127	49.81
Marital status		
Married	138	54.11
Single	109	42.74
Widow	8	3.15
Education		
Illiterate	11	4.31
Incomplete elementary school	44	17.25
Complete elementary school	32	12.54
Incomplete high school	8	3.13
Complete high school	111	43.52
Incomplete college degree	15	5.88
Complete college degree	33	12.94
Postgraduate degree	1	0.43
Monthly family income (minimum wage)		
Up to 1	40	15.68
2–3	133	52.15
4–5	65	25.49
More than 5	17	6.68
Race/Color		
White	30	11.76
Mestiza	8	3.13
Black	17	6.66
Brown	200	78.45

Table 2 – Association between the sociodemographic characteristics of women living in Roraima, Brazil, with a positive result of direct immunofluorescence for *Chlamydia trachomatis* from 2014 to 2015.

Sociodemographic characteristics	n	Positive n (%)	p-value
Age group			
18–28	54	15 (27.0)|	
29–39	72	31 (42.0)	0.129
40–60	129	40 (31.0)	
Marital status			
Married	135	41 (31.0)	
Widow	7	1 (14.5)	0.198
Single	112	44 (40.5)	
Education			
Illiterate	11	0 (0.0)	
Incomplete elementary school	48	23 (48.0)	
Complete elementary school	30	6 (20.0)	
Incomplete high school	9	4 (44.4)	
Complete high school	111	37 (33.3)	0.115
Incomplete college degree	13	5 (38.5)	
Complete college degree	32	10 (31.3)	
Postgraduate degree	1	1 (100.0)	
Residence			
Capital	215	72 (33.5)	
Interior	40	14 (35.0)	0.852
Race/Color			
White	35	13 (37.1)	
Mestiza	8	3 (37.5)	
Black	15	5 (33.3)	0.963
Brown	197	65 (32.9)|	
Family Income (wages)			
Up to 1	37	11 (29.8)	
2–3	139	45 (32.3)	
4–5	62	23 (37.0)	0.001
More than 5	17	07 (41.2)	

About the practice of anal sex, 175 (68.89%) reported had never practiced anal sex, while 79 (31.11%) claimed that do practice it. Concerning the prevalence of *C. trachomatis* infection among these 254 women, those ones who never practiced anal sex corresponded to 26.28%, while the other group was of 49.37%.

On the occurrence of miscarriages, however, of the 254 women who answered this question, 208 (81.89%) reported never had an abortion, while 46 (18.11%) claimed had already have it. The prevalence of infection with *C. trachomatis* between women who did not have an abortion was of 30.77%, and the second group of women was of 47.82%.

Finally, in case of pain and bleeding during sex, among 254 participants who responded to the question about pain, 155 (61.02%) claimed not to feel pain during sex, while 99 (38.98%) reported feeling pain. As far as pain during sex is concerned, the infection with *C. trachomatis* has a higher prevalence among women who reported feeling pain (51.51%). Those ones who reported no pain showed the prevalence of 22.58%. As for the bleeding, 199 (78.03%) women reported does not suffer bleeding during sex, while 56 (21.97%) claimed to suffer. When the positive result for *C. trachomatis* infection was related to the occurrence or absence of bleeding, the prevalence of infection among the group who reported no bleeding was of 25.62%, while the group who reported bleeding pointed out the prevalence of 62.50%.

Chi-square analysis constated that the variables pain (p=0.0001) and bleeding during sexual intercourse (p=0.0001) were associated with chlamydial infection in the sample analyzed. On the other hand, the association between *Chlamydia* and the occurrence of miscarriage (p=0.0391) was not evidenced.

The association between the variables and the positive result for *C. trachomatis* are described in **Table 3**. The result of the simple logistic regression identified the following: women with more than one sexual partner are 5.28 times more likely to get the infection;

those ones who practice anal sex are 2.73 times; the fact the woman works or had worked in mining increases the possibility of being infected by *Chlamydia* by 2.88 times; and those ones that have a partner who works or had worked in mining increases the risk of infection by 4.62 times. However, using condoms or having a STD partner did not show an association factor for *Chlamydia* infection in the analyzed sample.

On the other hand, multivariate logistic regression established that having more than one sexual partner (p=0.0098), practicing anal sex (p=0.0017) and having a sexual partner who works or had worked in mining (p=0.0002) indicated a significant association with *C. trachomatis* infection. The variable "having worked or worked in mining" was not statistically significant. Women who had more than one sexual partner are 4.27 times more likely to be infected with *C. trachomatis*, 2.99 times those ones who practice anal sex, and 3.66 times those ones who have sex partners who work or worked in mining (**Table 4**).

DISCUSSION

Epidemiological studies on infection with *C. trachomatis* have documented a high prevalence (1 to 30%) of the microorganism in active young and sexually women[13]. In India, the prevalence in 2009 among women was of 23%[14]. In Latin America, where countries do not have an effective program for the screening of this pathogen in their health policies, the data are few, but very expressive: in Argentina, the prevalence is of 26.4%[15], 7.6% in Peru, and 6.9% in Chile[16].

In Brazil, it is estimated the occurrence of approximately 1,967,200 new cases of *Chlamydia* every year[9]. The results of this survey differ from the ones obtained in studies about other regions of Brazil, as the investigation carried out in 2007 in the city of Recife involving 171 women. The referred research used the DIF technique in endocervical samples and showed the prevalence of 3.5% infection with *C. trachomatis*[17]. Another study carried out at the Instituto Fernandes Filgueiras, Rio de Janeiro, Brazil, also using DIF, pointed out the prevalence of 11% of *C. trachomatis* infection among women who had the normal oncotic cytology of a total group of 279 women[18]. The work developed at Hospital das Clínicas of the Medical School

Table 3 – Association between risk factors with positive result for *Chlamydia trachomatis* in women residing in Roraima, Brazil, from 2014 to 2015.

Variable	% (χ²)	p-value	OR (95%CI)
Number of sexual partners			
>1	70.00	0.0008	5.28 (1.95–14.20)
0 or 1	39.60		1.00
Anal sex			
Yes	49.30	0.0005	2.73 (1.56–4.76)
No	26.29		1.00
Works or had work in mining			
Yes	55.00	0.0031	2.88 (1.44–5,73)
No	29.77		1.00
Have a sexual partner who work or had worked in mining			
Yes	56.18	>0.0001	4.62 (2.64–8.09)
No	21.69		1.00
Use of condom			
Yes	37.50	0.9640	1.18 (0.41–3.37)
No	33.61		1.00
Partner with STD			
Yes	36.00	0.9756	1.11 (0.45–2.64)
No	33.48		1.00

OR: *odds ratio*; IC: confidence interval; STD: sexually transmitted diseases.

Table 4 – Results of multivariate logistic regression on the association between risk factors with positive results for *Chlamydia trachomatis* in women residing in Roraima, Brazil, from 2014 to 2015.

Variable	OR	95%CI	p-value
Number of sexual partners			
>1	4.27	1.41–12.90	0.0098
0 or 01	1.00		
Anal sex			
Yes	2.99	1.50–5.93	0.0017
No	1.00	1.00	
Work or had worked in mining			
Yes	0.95	0.40–2.26	0.9137
No	1.00		
Have a sexual partner who works or had worked in mining			
Yes	3.66	1.83–7.31	0.0002
No	1.00		

OR: *odds ratio*; IC: confidence interval; STD: sexually transmitted diseases.

of the Universidade de São Paulo, applying the same technique, found the prevalence of 7.8% among symptomatic women, and 4.3% among asymptomatic women[19].

Other studies developed through another analysis technique, the polymerase chain reaction (PCR), such as the one held in 2011, in São Paulo, Brazil, with 781 women, pointed out an infection prevalence with *C. trachomatis* of 8.4%[20]. In a research carried out in a city in Southern Brazil, in 2008, the prevalence of *C. trachomatis* infection was of 10.7%[21].

This study pointed out to the prevalence of 33.73% for *C. trachomatis* infection among women residing in the state of Roraima, a high percentage when compared to the ones of other Brazilian states. However, this result can be understood when this percentage is compared with data from health information systems that show Roraima as one of the Brazilian states with the highest prevalence of Human Immunodeficiency Virus (HIV) and Human Papilloma Virus infections.

In this study, the age was not considered as an associated factor for *C. trachomatis* infection. This result diverges from other studies that claim that one of the risk factors for *C. trachomatis* infections would be the age group, characterized as more susceptible individuals aged between 20 and 25 years old, probably due to this group's higher sexual activity or number of partners[22,23].

Regarding education, several surveys show that the highest rates of infection with *C. trachomatis* are among the women with a level of education from the 5th to the 8th grade of elementary education[22], i.e., a low level of education. However, these statements differ from the result of this study, which concluded that in the analyzed sample low education cannot be considered a risk factor for infection with *C. trachomatis*. On the other hand, confirming the results of this survey, a study conducted by Oliveira et al. in a rural area of Northeastern Brazil pointed out that the educational level is not associated with the risk of STD infection. According to the same authors, similar results were obtained in studies carried out in the rural areas of Nepal and China[18].

Concerning to family income, the result achieved in this research diverges completely from the results available in the literature[24,25], since it points out that the higher prevalence of this infection occurred among women who reported the highest monthly income (above five minimum wages) and the lowest prevalence occurred among women with lower income (less than one minimum wage). Therefore, a higher purchasing power acts as an associated factor for the infection with *C. trachomatis* in the sample analyzed. So, a higher monthly income does not create the awareness that women of Roraima need to protect themselves against infection with this microorganism.

With respect to the number of partners, having more than one sexual partner is part of the risk score for this infection[24]. The results of this study indicate that having more than one sexual partner is a variable associated with infection with *C. trachomatis* between women of Roraima. This finding is consistent with studies claiming that the number of sexual partners and the frequent exchange of partners are risk factors for infection and reinfection with *C. trachomatis*[21].

As for the condom use during sex, despite the very low adhesion, since 93% of women declared not using it, this fact is not configured as a variable associated with infection with *C. trachomatis*, diverging from the literature on the topic[22]. Therefore, a doubt arises whether women who have claimed always using a condom during sex did not tell the truth or use it incorrectly.

As Roraima is a state of international borders with two countries (Venezuela and British Guiana), where the practice of gold and diamond mining is legal, we decided to evaluate the relationship between the positive result for *C. trachomatis* infection and the fact that women work or had worked in mines or have sex partners in this activity. In this way, the fact that women related sex with a partner who had worked or works in mining was cited as a factor associated with chlamydial infection in this research, both univariate and multivariate. On the other hand, the fact that the participant of the research had some day worked or still work in mining was shown as a variable linked with the infection only in univariate analysis, failing to be in the multivariate analysis. Among the studied literature, it was not evidenced any correlate study between women or their sexual partner working in mining and the increase of the prevalence of *C. trachomatis* infection.

With respect to the presence of symptoms such as pain and bleeding during intercourse, studies revealed that most of the infected women is asymptomatic[2,24]. Diverging from these authors, in this study the bleeding during sex was present at 62.50% of women with *C. trachomatis* infection, and pain in 51.51%. It is appropriate to point out that none of the samples collected for DIF was bloody, thus not impairing the quality of the results. In this way, the results of this study indicate that, for this sample, bleeding and pain during intercourse is correlated with the infection by this microorganism.

Finally, with regard to sex, no study was found in the literature evaluating the association between the practice of anal sex and the increased risk of *Chlamydia* infection, but the present study showed that women having anal sex are 2.99 times more likely to be infected with this microorganism.

Some limitations became evident during this research, and among them the most relevant one was the insufficiency of data on the epidemiology of *C. trachomatis* infection in the state of Roraima, including official information systems of the Ministry of Health, hindering the establishment of parameters to determine the sampling universe and to institute a more regionalized discussion of the results. Added to that, another limitation to be mentioned is the DIF method, since a trained microscopist is required to accomplish it, and it is difficult to process a large number of samples. Experience in the interpretation of the immunofluorescence is fundamental as the nonspecific antibody binding to other micro-organisms can occur, leading to a false-positive result[12].

CONCLUSION

The results showed a high prevalence of infection with *C. trachomatis* in women resident in the state of Roraima, as well as the correlation between this infection and associated factors related to intercourse, such as multiple partners, non-adherence to condom use, anal sex practice, and intercourse with partners who work or had worked in mines. In this way, the findings indicate the inefficiency of public health policies to fight the infection with *C. trachomatis* in Roraima, besides the need of a more effective sex education work.

Conflict of interests

The authors declare no conflict of interests.

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