Article/Artigo

Prevalence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infection in men attending STD clinics in Brazil

Prevalência de *Neisseria gonorrhoeae* e infecção pela *Chlamydia trachomatis* em homens atendidos em clínicas de DST no Brasil

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ABSTRACT

Introduction: The study aimed to assess the prevalence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections and identify demographic, behavioral and clinical factors correlated with such infections in men attending six sexually transmitted disease clinics in Brazil. **Methods**: Multicentric, cross-sectional study performed among men attending STD clinics in Brazil. The study included STD clinics in six cities distributed throughout the five geographic regions of Brazil in 2005. Patients provided 20 ml of first catch urine for testing for NG and CT by DNA-PCR. **Results**: A total of 767 (92.9%) men were included in the study. The mean age was 26.5 (SD 8.3) years-old. Prevalence of *Chlamydia* infection was 13.1% (95%CI 10.7%-15.5%) and gonorrhea was 18.4% (95%CI 15.7%-21.1%). Coinfection prevalence was 4.4% (95%CI 2.95%-5.85%) in men who sought attendance in STI clinics. Factors identified as associated with *C. trachomatis* were younger age (15-24) [OR=1.4 (95%CI 1.01-1.91)], present urethral discharge [OR=4.8 (95%CI 1.52-15.05)], genital warts [OR=3.0 (95%CI 1.49-5.92)] and previous history of urethral discharge [OR=2.4 (95%CI 1.11-5.18)]. Variables associated with gonorrhea were younger age (15 to 24) [OR=1.5 (95%CI 1.09-2.05)], presence of urethral discharge [OR=9.9 (95%CI 5.53-17.79)], genital warts [OR=18.3 (95%CI 8.03-41.60)] and ulcer present upon clinical examination [OR=4.9 (95%CI 1.06-22.73)]. **Conclusions**: These findings have important implications for education and prevention actions directed toward men at risk of HIV/STD. A venue-based approach to offer routine screening for young men in STD clinics should be stimulated.

Key-words: *Chlamydia trachomatis*. *Neisseria gonorrhoeae*. Risk factors. Multicentric study. STD clinic. PCR.

RESUMO

Introdução: Nosso objetivo foi acessar a prevalência de *Neisseria gonorrhoeae* e *Chlamydia trachomatis* e identificar fatores demográficos, comportamentais e clínicos correlacionados a essas infecções em homens atendidos em clínicas de doenças sexualmente transmissíveis no Brasil. **Métodos**: Estudo multicêntrico, transversal conduzido em homens que procuraram atendimento em clínicas de DST. O estudo incluiu clínicas de DST em seis cidades distribuídas nas cinco regiões geográficas do Brasil em 2005. Pacientes coletaram 20ml do primeiro jato de urina para testar NG e CT por DNA-PCR. **Resultados**: Um total de 767 (92,9%) homens foi incluído no estudo. A média de idade foi 26,5 (DP 8,3) anos. A prevalência de infecção por CT foi 13,1% (IC95% 10,7%-15,5%) e NG de 18,4% (IC95% 15,7%-21,1%). A prevalência de co-infecção foi 4,4% (IC95% 2,95%-5,85%). Os fatores identificados como sendo associados com a infecção pela CT foram ser jovem (15-24) [OR=1,4 (IC95% 1,01-1,91)], apresentar corrimento uretral ao exame [OR=4,8 (IC95% 1,52-15,05)], verrugas genitais [OR=3,0 (IC95% 1,49-5,92)] e história prévia de corrimento uretral [OR=2,4 (IC95% 1,11-5,18)]. As variáveis associadas com a gonorréia foram ser jovem (15 to 24) [OR=1,5 (IC95% 1,09-2,05)], apresentar corrimento uretral [OR=9,9 (IC95% 5,53-17,79)], verrugas genitais [OR=18,3 (IC95% 8,03-41,60)] e úlcera ao exame clínico [OR=4,9 (IC95% 1,06-22,73)]. **Conclusões**: Estes resultados têm implicações importantes para medidas de educação e prevenção direcionadas aos homens com risco acrescido de HIV/DST. A abordagem no serviço para oferecer testes de rotina para homens jovens atendidos em clínica de DST deve ser estimulada.

Palavras-chaves: *Chlamydia trachomatis*. *Neisseria gonorrhoeae*. Fatores de risco. Estudo multicêntrico. Clínicas DST. PCR.

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INTRODUCTION

The importance of understanding and addressing *Chlamydia trachomatis* (CT) infections and gonorrhea among men is being recognized in several studies[1,2]. The role of identifying and treating male infections in preventing adverse outcomes among women has prompted some researchers to call for *Chlamydia trachomatis* and gonorrhea screening guidelines directed at detecting male infections[3,4].

Untreated infections may have direct adverse outcomes among men, including epididymitis, prostatitis and proctitis[4,5]. Currently, males are opportunistically tested for *C. trachomatis* infection and/or gonorrhea; recommendations for routinely screening males for these infections are discouraged[1]. Although several existing studies have examined *Chlamydia* and *gonorrhea* infections in men, these studies are geographically limited, targeted to a certain portion of the population[6-9].

Sexually transmitted disease (STD) Treatment Guidelines of the Centers for Disease Control and Prevention (CDC) recommend empirical treatment for *C. trachomatis* when treating a diagnosed gonococcal infection, because *Chlamydia* coinfection is frequent among individuals diagnosed with gonorrhea[4]. Frequently, coinfection data are derived from STI clinic settings, where patients are likely to present with symptoms of, or suspected exposure to, an STD[10].

National published data regarding *C. trachomatis* infections and gonorrhea among men in Brazil is not available, while prevalence date for these infections are available only in local studies[11,12]. In this study, the prevalence of *Neisseria gonorrhoeae* (NG) and *Chlamydia trachomatis* infection and the coinfection rate were assessed and correlated demographic, behavioral and clinical factors were identified in an at-risk population during a multicentric study among men attending STD clinics in six cities in Brazil distributed among the five geographical regions. The information will be used for planning prevention and assistance programs to reach this population.

METHODS

A multicentric, cross-sectional study conducted among men attending STD clinics in Brazil. The study included STD clinics in six geographically diverse cities in Brazil (São Paulo, Rio de Janeiro, Porto Alegre, Goiânia, Fortaleza and Manaus) in 2005.

Population

Men seeking care during their first visit to a STD clinic and with no history of antibiotic therapy in the preceding 15 days were invited to take part in the study. HIV positive men were excluded.

Sample size

Based on a priori power calculations, the study required the enrollment of 750 men to provide 80% power to estimate a point prevalence of *Chlamydia* and *gonorrhea* coinfection at 5%[11] with a 95% confidence interval of (3.5%-6.5%). Considering a refusal rate of 10%, 825 men were required. All men sampled who met the eligibility criteria were invited to participate.

Subject selection and eligibility criteria

Health professionals invited men attending STD clinics for the first time to take part in the study. At the time of screening, all men in the multicentric study were asked to complete a standard questionnaire involving demographic, behavioral and clinical data, including STD symptoms. Those who accepted screening provided a urine specimen. *Gonorrhea* and/or *Chlamydia* infected men were notified and treated according to the Brazilian National STD guidelines[13]. Patients received counseling to advise all their sexual partners in order to provide testing and treatment. Determination of research-exempt status or human subjects review and approval was obtained from all participating institutions. Free, informed consent was obtained and patient confidentiality was maintained, as required by law.

Laboratory specimens

Patients provided 20ml of first catch urine to test for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* by DNA detection using Polymerase Chain Reaction (PCR; Cobas Amplicor CT/NG, Roche Diagnostics Systems, USA). These tests are the most sensitive available.

Statistical analysis

Standard descriptive statistical analyses were performed, including frequency distributions for categorical data and calculation of means and standard deviations for continuous variables. Prevalence of coinfection was defined as the detection of both *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in a single urine specimen. It was calculated to reflect its relative frequency, with corresponding 95% confidence intervals (95%CI). Odds ratios and 95%CI were calculated in bivariate analyses to estimate the strength of the association between infections and each potential risk factor. Independent risk factors for each infection were assessed using stepwise logistic regression: variables significant at P 0.05 in bivariate analysis were entered into the model and additional variables were entered into the multivariate model based on known a priori associations (for instance, age and number of sex partners).

Ethical

The Ethics in Research National Committee approved the protocol for the study. Written, informed consent was obtained by all participants and their parents or guardians (if <18 years), in accordance with Brazilian legal guidelines.

RESULTS

A total of 767 (92.9%) men were included in the study. The mean age was 26.5 (SD 8.3) years-old. The global prevalence of *C. trachomatis* infection was 13.1% (95%CI 10.7%-15.5%) and gonorrhea was 18.4% (95%CI 15.7%-21.1%). Coinfection prevalence was 4.4% (95%CI 2.95%-5.85%) in men who sought attendance at STD clinics.

Table 1 shows the correlations between demographic characteristics and STD prevalence: 52.4% of men were 15 to 24 years-old, 55.4% had nine or more years of education, 59.8% were single and 73.5% earned a monthly income of four or less Brazilian minimum wages (1 Brazilian minimum wage = US$ 150 in 2005). The only correlation was between *C. trachomatis* infection and age from 25 to 34 years-old.

TABLE 1 - Prevalence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections and their correlation with demographic factors among men attending STD clinics in six cities in Brazil, 2005 (n=767).

Variables	CT (n=101)			GC (n=141)		
	n	%	OR (95%CI)	n	%	OR (95%CI)
Age in years						
up to 24	53	13.2	1.8 (0.88-3.85)	80	19.9	1.7 (0.94-3.09)
24 to 34	39	15.8	2.3 (1.06-4.86)	46	18.6	1.6 (0.84-2.95)
35 or older	9	7.6	1	15	12.7	1
Education						
up to 4 years	12	14.1	(0.56-2.17)	17	20.0	1.1 (0.59-1.90)
5 to 8	34	13.2	(0.65-1.62)	43	16.7	0.9 (0.57-1.28)
nine or more	55	12.9	1	81	19.1	1
Marital status						
married/living together	27	10.2	0.8 (0.30-2.31)	39	14.7	(0.41-2.61)
single	69	15.0	(0.50-3.45)	96	20.9	1.59 (0.65-3.89)
divorced/widow	5	11.9	1	6	14.3	1
Monthly income*						
< 2 minimal wage	23	14.1	(0.55-1.79)	36	22.1	(0.74-2.06)
2 to 4 minimal wage	49	12.3	0.8 (0.51-1.38)	67	16.8	0.9 (0.57-1.36)
5 or more	29	14.2	1	38	18.6	1

*One Brazilian minimal wage in 2005 = US$150. **CT:** *Chlamydia trachomatis*, **GC:** *Neisseria gonorrhoeae*.

Regarding risk behaviors, 339 participants reported first sex intercourse at ≤ 14 years of age, 85.4% reported one partner in the preceding 12 months, 20.1% reported regular use of condoms and 13.4% reported injecting drug use. Having one sexual partner in the preceding 12 months had a negative correlation with a diagnosis of gonorrhea (**Table 2**).

Table 3 describes clinical symptoms; previous history of genital warts was correlated with *Chlamydia trachomatis* and *Neisseria gonorrhoeae* and having a sexual partner with a genital ulcer was correlated with gonorrhea. In clinical examinations, presenting urethral discharge, genital ulcers and genital vesicles were associated with *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections.

Factors identified as being independently associated with *Chlamydia trachomatis* in the final multiple logistic model were younger age (15-24) [OR=1.4(95%CI 1.01-1.91)], presence of urethral discharge [OR=4.8(95%CI 1.52-15.05)], genital warts [OR=3.0(95%CI 1.49-5.92)] and previous history of urethral discharge [OR=2.4(95%CI 1.11-5.18)]. Variables associated with *Neisseria gonorrhoeae* were younger age (15 to 24) [OR=1.5 (95%CI 1.09-2.05)], presence of urethral discharge [OR=9.9 (95%CI 5.53-17.79)], genital warts [OR=18.3 (95%CI 8.03-41.60)] and ulcer upon clinical examination [OR=4.9(95%CI 1.06-22.73)] (**Table 4**).

TABLE 2 - Prevalence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections and their correlation with behavioral factors among men attending STI clinics in six cities in Brazil, 2005 (N=767).

Variables	CT infection (n=101)			GC (n=141)		
	n	%	OR (95%CI)	n	%	OR (95%CI)
Age at first sex						
up to 14 years	41	12.1	0.8 (0.55-1.29)	70	20.6	1.3 (0.91-1.89)
15 or older	60	14.0	1	71	16.6	1
Number of sex partners in last 12 months						
one	82	12.5	0.7 (0.41-1.21)	110	16.8	0.5 (0.33-0.84)
more than one	19	17.0	1	31	27.7	1
Regular use of condoms						
yes	15	9.7	0.7 (0.37-1.18)	21	13.6	0.6 (0.39-1.07)
no	86	14.0	1	120	19.6	1
MSM						
yes	47	12.6	0.9 (0.59-1.37)	73	19.5	1.2 (0.80-1.67)
no	54	13.7	1	68	17.3	1
IDU						
yes	16	15.5	1.3 (0.70-2.24)	17	16.5	0.9 (0.49-1.50)
no	85	12.8	1	124	18.7	1

MSM: men who have sex with men, **IDU:** injecting drug use. **CT:** *Chlamydia trachomatis*, **GC:** *Neisseria gonorrhoeae*.

TABLE 3 - Prevalence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections and their correlation with clinical factors among men attending STI clinics in six cities in Brazil, 2005 (N=767).

Variables	CT (n=101)			GC (n=141)		
	n	%	OR (95%CI)	n	%	OR (95%CI)
Previous symptoms of STI						
urethral discharge	86	13.5	1.2 (0.67-2.15)	110	17.3	1.1 (0.42-1.25)
genital warts	61	17.8	2.1 (1.36-3.20)	93	27.2	2.9 (1.99-4.30)
genital ulcer	24	10.5	0.7 (0.43-1.15)	26	11.4	0.5 (0.30-0.75)
genital vesicles	17	11.4	0.8 (0.47-1.43)	18	12.1	0.6 (0.33-1.00)
Partner with STI symptoms						
urethral discharge	4	16.7	1.3 (0.45-3.98)	4	16.7	0.9 (0.30-2.63)
genital warts	25	15.2	1.2 (0.76-2.02)	35	21.2	1.3 (0.82-1.93)
genital ulcer	7	11.7	1.2 (0.51-2.63)	4	6.7	3.4 (1.20-9.43)
genital vesicles	4	15.4	1.2 (0.41-3.58)	3	11.5	0.6 (0.17-1.93)
Physical examination						
urethral discharge	41	40.6	2.4 (1.56-3.73)	112	79.4	27.8 (17.37-44.79)
genital warts	9	7.8	1.9 (0.94-3.97)	2	1.7	15.4 (3.75-62.50)
genital ulcer	16	5.6	3.6 (2.08-6.33)	12	4.2	8.4 (4.55-15.38)
genital vesicles	71	22.5	4.1 (2.59-6.44)	129	41.0	25.4 (13.71-46.97)

CT: *Chlamydia trachomatis*, **GC:** *Neisseria gonorrhoeae*.

TABLE 4 - Multivariate analysis of factors associated with *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections among men attending STI clinics in six cities in Brazil, 2005 (N=767).

Factors	Adjusted Odds Ratio	95%CI	P value
Chlamydia trachomatis			
Younger age (15-24 years)	1.38	1.01-1.91	0.048
Urethral discharge upon physical examination	4.78	1.52-15.05	0.007
Genital warts upon physical examination	2.97	1.49-5.92	0.002
History of urethral discharge	2.40	1.11-5.18	0.026
Neisseria gonorrhoeae			
Younger age (15-24 years)	1.50	1.09-2.05	0.012
Urethral discharge upon physical examination	9.92	5.53-17.70	0.001
Genital warts upon physical examination	18.28	8.03-41.60	0.001
Genital ulcer upon physical examination	4.90	1.06-22.73	0.042

DISCUSSION

This study sought to investigate the prevalence of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections and assess associated risk exposures in men attending STD clinics in Brazil. Analysis of the results verified that 4.4% of men had both infections. The coinfection rate obtained was consistent with the results of previous studies conducted among the male population in Brazil[11,12] and other countries[8,14].

The isolated frequency of each infection reported in this study was high, as expected in an STD clinic, 13.1% and 18.4% of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, respectively. Since male gonococcal infections are largely symptomatic[15], diagnostic testing, rather than routine screening, has been the recommended disease control strategy, and national disease rates in men reflect mainly symptomatic infection. Although there is evidence that asymptomatic gonococcal infections in heterosexual men may contribute disproportionately to disease transmission to women[14], relatively few studies have measured the prevalence of *Neisseria gonorrhoeae* infection among asymptomatic men[9,16,17]. Regarding *C. trachomatis* infection, the rate of asymptomatic infection is higher[18].

The main risk factors reported in the literature as associated with *C. trachomatis* infections are age below 25 years-old, inconsistent condom use, multiple sexual partners, a new partner in the preceding 60 days and a history of STD[11,19,20]. In this study, an association among younger men (15-24 years-old) with infections was identified, but no association with reporting more than one partner in the preceding 12 months, inconsistent condom use and previous STD was included in the final model.

There is a lack of current evidence-based data for clinical symptoms and coinfection diagnosis in male populations[4,8]. An association between *C. trachomatis* infection and gonorrhea with urethral discharge was verified in this study. This it was an expected result even when considering that these infections can be asymptomatic in numerous cases[18]. An association between genital ulcer and genital vesicles and gonorrhea upon clinical examination

was also verified. This can be explained by the fact that STD are frequently associated. It is important to highlight that STD are often transmitted through the same route and treating them may reduce the incidence of HIV and other STD, an important measure in prevention planning and care services[21]. Prevalence assessment and monitoring is an important component of STD control and both can be performed on vulnerable populations.

The limitations of this study include the distribution and the nature of the sample, which could limit inferences to other data in Brazil and the cross-sectional design, which precludes inferences concerning cause and effect. However, the response rate obtained was high and multicentric data are highly relevant and generalizable to men attending STD clinics in Brazil. Nevertheless, the Brazilian population is highly heterogeneous and inferences from this study may be limited regarding men attending primary health clinics or private health care. The possibility of response bias, owing to the tendency to provide socially acceptable answers, cannot be excluded. We suggest that such biases would result in the under-estimation of risky attitudes and behaviors. Inaccuracies of recall of condom use, age of first intercourse and number of sexual partners also may have occurred.

Besides the impact on *C. trachomatis* prevalence and associated morbidity among female partners, the cost of male screening for *C. trachomatis* and *N. gonorrhoeae* is in large part determined by the ease of access to males who are shown to be at high risk of these infections[2]. This forms the rationale for a venue-based approach in which men in specific venues, with demonstrated high rates of these infections, such as the STD clinic population, are offered testing. The identification and treatment of sex partners is also a cornerstone of STD prevention efforts and reduces the risk of reinfection. Findings from this study have implications for education and prevention efforts, including routine counseling and diagnostic tests directed toward young men at risk of HIV/STD.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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