

Chlamydia trachomatis and *Neisseria gonorrhoeae* Transmission From the Female Oropharynx to the Male Urethra

Julia L. Marcus, MPH, Robert P. Kohn, MPH, Pennan M. Barry, MD, MPH,
Susan S. Philip, MD, MPH, and Kyle T. Bernstein, PhD, ScM

Abstract: In a sexually transmitted disease clinic-based sample of men who have sex with women, positivity for urethral *Chlamydia trachomatis* and *Neisseria gonorrhoeae* was 3.5% and 3.1%, respectively, among patients whose only urethral exposure in the previous 3 months was receiving fellatio from a woman. Urethral infections acquired by fellatio might contribute to ongoing disease spread.

Chlamydia trachomatis and *Neisseria gonorrhoeae* infections are the 2 most commonly reported notifiable diseases in the United States.¹ Transmission of *C. trachomatis* and *N. gonorrhoeae* from the male urethra to the oropharynx through oral sex has been well described,^{2,3,4} but limited data exist on transmission from the oropharynx to the male urethra. In 2 clinic-based samples of men who have sex with men (MSM), 25% to 58% of patients diagnosed with urethral gonorrhea by culture reported that their only recent exposure was receiving fellatio.^{4,5} Using nucleic acid amplification testing, which has higher sensitivity than culture,⁶ we found urethral *C. trachomatis* and *N. gonorrhoeae* positivity of 4.8% and 4.1%, respectively, in a clinic-based sample of MSM whose only urethral exposure was receiving fellatio.⁷ To our knowledge, no studies have used nucleic acid amplification testing to examine transmission of *C. trachomatis* and *N. gonorrhoeae* from the female oropharynx to the male urethra.

Our objective for this study was to estimate the prevalence of urethral *C. trachomatis* and *N. gonorrhoeae* infections that were likely transmitted from the female oropharynx to the male urethra. Our analysis included men who have sex with women (MSW) who reported receiving fellatio from a woman but not practicing insertive vaginal or anal sex in the 3 months before testing. To provide context for these data, we also examined MSW who did not receive fellatio but reported practicing unprotected insertive vaginal or anal sex, behavior that is considered to involve high risk for urethral infection.^{2,3}

We conducted a cross-sectional study of MSW who were tested for urethral *C. trachomatis* or *N. gonorrhoeae* at San Francisco's municipal sexually transmitted disease (STD) clinic from July 1, 2006 through June 30, 2010. We included

males who did not identify as gay or bisexual and who had not reported sex with male partners at any clinic visit. We assessed positivity for urethral *C. trachomatis* or *N. gonorrhoeae* in 2 groups of patient visits: (1) those by MSW who reported receiving fellatio but not practicing insertive vaginal or anal sex in the previous 3 months, and (2) those by MSW who reported practicing unprotected insertive vaginal or anal sex but did not report receiving fellatio in the previous 3 months. We excluded visits by MSW who were not tested for urethral *C. trachomatis* or *N. gonorrhoeae* or for whom data on sexual practices were not available. Clinicians conducted standardized interviews with patients as part of the STD clinic visit; we obtained data from clinic records on sexual practices in the previous 3 months. We used nucleic acid amplification (Gen-Probe AP-TIMA Combo 2; Gen-Probe) to test urine specimens for *C. trachomatis* and *N. gonorrhoeae*.

We estimated urethral positivity and corresponding 95% confidence intervals (CI) for *C. trachomatis* and *N. gonorrhoeae* among visits by MSW in the 2 groups, and used chi-square statistics to compare urethral positivity for each infection between the 2 groups of patient visits. We also calculated the proportion of all urethral *C. trachomatis* and *N. gonorrhoeae* infections among MSW that were among men whose only reported exposure was receiving fellatio. These data were deidentified for retrospective analysis and evaluated for the purpose of public health improvement; thus, this study was considered exempt from human subjects considerations in accordance with the Code of Federal Regulations, Title 45.

There were 11,360 clinic visits by MSW that included a urine test for either *C. trachomatis* ($n = 11,357$) or *N. gonorrhoeae* ($n = 7031$). Of those visits, sexual behavior data were available for 10,817 (95.2%) and 6717 (95.5%), respectively. Fellatio was the only urethral exposure reported among 227 (2.1%) MSW tested for *C. trachomatis* and 161 (2.4%) of MSW tested for *N. gonorrhoeae*. Among those men, the positivity for urethral *C. trachomatis* and *N. gonorrhoeae* infections was 3.5% (95% CI, 1.5%–6.8%; $n = 8$) and 3.1% (95% CI, 1.0%–7.1%; $n = 5$), respectively. Unprotected insertive vaginal or anal sex was the only urethral exposure among 2609 (24.1%) of MSW tested for *C. trachomatis* and 1541 (22.9%) of MSW tested for *N. gonorrhoeae*. Urethral positivity in this group was 9.0% (95% CI, 8.0%–10.2%; $n = 236$) for *C. trachomatis* and 6.9% (95% CI, 5.7%–8.3%; $n = 106$) for *N. gonorrhoeae* infections; positivity was higher for *C. trachomatis* ($P = 0.004$) and *N. gonorrhoeae* ($P = 0.064$) compared with visits by MSW reporting only receiving fellatio (Fig. 1). Among the 833 and 321 urethral *C. trachomatis* and *N. gonorrhoeae* infections diagnosed among MSW at City Clinic during this period and for whom sexual behavior data were available, 8 (1.0%) and 5 (1.6%), respectively, were among patients whose only urethral exposure was receiving fellatio.

From the San Francisco Department of Public Health, San Francisco, CA Supported by Comprehensive STD Prevention Projects (1H25PS001354–01), Centers for Disease Control and Prevention.

Correspondence: Julia L. Marcus, MPH, STD Prevention and Control Services, San Francisco Department of Public Health, 1360 Mission St, Ste 401, San Francisco, CA 94103. E-mail: julia.marcus@sfdph.org.

Received for publication June 28, 2010, and accepted October 3, 2010. DOI: 10.1097/OLQ.0b013e3182029008

Copyright © 2010 American Sexually Transmitted Diseases Association

All rights reserved.

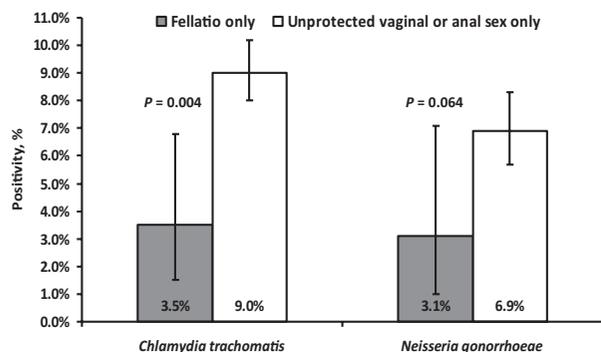


Figure 1. Urethral *Chlamydia trachomatis* and *Neisseria gonorrhoeae* positivity among men who have sex with women who visited the San Francisco City Clinic, 2006–2010.

In this cross-sectional study at an STD clinic, we found that positivity for urethral *C. trachomatis* and *N. gonorrhoeae* was 3.5% and 3.1%, respectively, among men whose only urethral exposure was receiving fellatio from a woman. These data suggest that transmission of *C. trachomatis* and *N. gonorrhoeae* from the female oropharynx to the male urethra can occur and that urethral infections acquired by fellatio might contribute to ongoing disease spread among men and their female sexual partners. To our knowledge, there have been no prior studies that used nucleic acid amplification testing to examine transmission of *C. trachomatis* and *N. gonorrhoeae* from the female oropharynx to the male urethra.

In our previous study of MSM whose only urethral exposure was receiving fellatio,⁷ we found urethral positivity for *C. trachomatis* (4.8%) and *N. gonorrhoeae* (4.1%) that was similar to the positivity found among MSW in the current study. While there was no difference in *C. trachomatis* positivity between the 2 groups examined in the MSM study ($P = 0.153$), urethral positivity was higher for both infections among visits by MSW reporting only unprotected insertive vaginal or anal sex compared with those reporting only receiving fellatio (borderline statistical significance for *N. gonorrhoeae*: $P = 0.064$). It might be that there are differences in the dynamics of *C. trachomatis* or *N. gonorrhoeae* transmission from the vagina compared with transmission from the rectum. Furthermore, more MSM than MSW reported only receiving fellatio (7% vs. 2%), so the proportion of all urethral infections that were attributable to fellatio was higher in that group (6% vs. 1%). However, while transmission from the female oropharynx to the urethra appears to be rare, our data suggest that there is some risk of infection from fellatio, and that risk should be communicated to patients when appropriate.

The occurrence of transmission from the female oropharynx to the male urethra suggests that the female oropharynx might be an unaddressed reservoir for *C. trachomatis* and *N. gonorrhoeae* infections. Pharyngeal gonorrhea has a lower cure rate than rectal or urogenital gonorrhea,⁸ is largely asymptomatic, and is not currently a focus of STD control efforts. Recent reports have documented the increasing emergence of antimicrobial-resistant *N. gonorrhoeae*⁹ and treatment failures,¹⁰ with evidence that the genetic alterations associated with resistance were acquired from commensal *N. gonorrhoeae* species in the pharynx.¹¹ These factors suggest that the pharynx

might play an important role in the development and transmission of antimicrobial-resistant *N. gonorrhoeae*, and that diagnosing and treating those infections might influence the spread of resistant organisms.

This study has several limitations. Data were collected from MSW seeking care at an STD clinic, and might not be representative of all MSW in San Francisco or other settings. The analysis was cross-sectional and data on sexual behavior relied on self-report, which might have been influenced by social desirability or recall bias. Data on sexual practices were restricted to the 3 months before testing, but some infections might have been acquired before and persisted throughout that period, particularly among patients who were asymptomatic. Finally, we did not restrict the analysis to visits by patients who reported fellatio without condom use; however, over 99% of MSW who only received fellatio in the previous 3 months reported not using condoms.

In this STD clinic-based cohort of MSW, we demonstrated the likely transmission of *C. trachomatis* and *N. gonorrhoeae* from the female oropharynx to the male urethra. Patients should be counseled that urethral infections can be acquired through fellatio. Additional studies that use highly sensitive nucleic acid amplification tests to sample multiple anatomical sites might contribute to a better understanding of the transmission and public health impact of *C. trachomatis* and *N. gonorrhoeae* infections.

REFERENCES

- Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance, 2008. Atlanta, GA: US Department of Health and Human Services, 2009. Available at: <http://cdc.gov/std/stats08>. Accessed June 7, 2010.
- Stamm WE. *Chlamydia trachomatis* infections in the adult. In: Holmes KK, Sparling PF, Stamm WE, et al, eds. Sexually Transmitted Diseases. 4th ed. New York, NY: McGraw Hill, 2008.
- Hook EW III, Handsfield HH. Gonococcal infections in the adult. In: Holmes KK, Sparling PF, Stamm WE, et al, eds. Sexually Transmitted Diseases. 4th ed. New York, NY: McGraw Hill, 2008.
- Lafferty WE, Hughes JP, Handsfield HH. Sexually transmitted diseases in men who have sex with men: Acquisition of gonorrhea and nongonococcal urethritis by fellatio and implications for STD/HIV prevention. *Sex Transm Dis* 1997; 24:272–278.
- Janier M, Lassau F, Casin I, et al. Pharyngeal gonorrhoea: The forgotten reservoir. *Sex Transm Infect* 2003; 79:345.
- Johnson RE, Newhall WJ, Papp JR, et al. Screening tests to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections—2002. *MMWR Recomm Rep* 2002; 51(RR-15):1–38.
- Bernstein KT, Stephens SC, Barry PM, et al. *Chlamydia trachomatis* and *Neisseria gonorrhoeae* transmission from the oropharynx to the urethra among men who have sex with men. *Clin Infect Dis* 2009; 49:1793–1797.
- Manavi K, Young H, McMillan A. The outcome of oropharyngeal gonorrhoea treatment with different regimens. *Int J STD AIDS* 2005; 16:68–70.
- Pandori M, Barry PM, Wu A, et al. Mosaic penicillin-binding protein 2 in *Neisseria gonorrhoeae* isolates collected in 2008 in San Francisco, California. *Antimicrob Agents Chemother* 2009; 53:4032–4034.
- Tapsall J, Read P, Carmody C, et al. Two cases of failed ceftriaxone treatment in pharyngeal gonorrhoea verified by molecular microbiological methods. *J Med Microbiol* 2009; 58:683–687.
- Barry PM, Klausner JD. The use of cephalosporins for gonorrhea: The impending problem of resistance. *Expert Opin Pharmacother* 2009; 10:555–577.