Published in final edited form as:
Sex Transm Dis. 2008 October ; 35(10): 859–861. doi:10.1097/OLQ.0b013e31817bbcb4.

Neisseria gonorrhea and Chlamydia trachomatis *Among Human Immunodeficiency Virus-Infected Women*

KATHLEEN R. PAGE, MD[*], **RICHARD D. MOORE, MD**[*,†], **BARBARA WILGUS, CRNP**[*], **RENEE GINDI, BA**[†], and **EMILY J. ERBELDING, MD, MPH**[*]

[*] *Department of Medicine, Johns Hopkins University, School of Medicine, Baltimore, Maryland* [†] *Department of Epidemiology, The Johns Hopkins University, Bloomberg School of Public Health, Baltimore, Maryland*

Screening For Sexually Transmitted Diseases (STD) is a routine component of primary human immunodeficiency virus (HIV) care,[1] but there are limited data for selective screening guidelines for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (GC) infection in HIV-infected women. The US Preventive Services Task Force recommends CT and GC testing for all sexually active women ≤25 years, and older women with other risk factors, such as multiple or new sexual partners or a history of STDs.[2,3] Screening prevents serious complications such as pelvic inflammatory disease, ectopic pregnancy, chronic pelvic pain, and infertility in women with asymptomatic CT or GC. In HIV-infected individuals, infection with CT or GC is also an important biologic marker of behavior that may expose others to HIV. Furthermore, CT or GC is associated with increased cervicovaginal HIV shedding that may increase HIV transmissibility.[4] Identification of HIV-infected women with CT or GC helps target prevention intervention promoting safer sexual practices, and treatment of STDs may impact heterosexual HIV transmission.

In this study, we determine risk factors for CT and GC infection in women receiving HIV continuity care using data from the Johns Hopkins HIV Clinical Cohort. The Johns Hopkins HIV Clinical Cohort is a longitudinal observational study of adult patients (≥18 years old) in HIV care in the Johns Hopkins HIV Clinic. Only patients with a confirmed diagnosis of HIV can receive care at the Johns Hopkins HIV Clinic and are eligible for enrollment in the cohort. After informed consent, information is collected by medical record technicians and electronically from several sources including outpatient and inpatient medical records, Johns Hopkins Health System automated databases, supplemental medical records from outside facilities, and vital records. Less than 1% of patients have refused consent. Comprehensive demographic, clinical, laboratory, and pharmaceutical data are collected and summarized at enrolment and at 6-month intervals. Maintenance of the database and use of its contents for analysis was approved by the Institutional Review Board of The Johns Hopkins University School of Medicine. Details of the database design have been described previously.[5]

We identified women in the cohort who had a CT or GC test result performed in the Johns Hopkins Hospital laboratory between January 1996 and January 2006. In patients who had multiple CT or GC test results, only results from the first test were analyzed. CT and GC tests included both culture methods and nucleic acid amplification tests (NAATs). We compared demographic, clinical, and behavioral factors between women with positive or negative CT or GC results. We tested univariate associations using χ^2 or Fisher exact test for categorical

Correspondence: Kathleen R. Page, MD, Division of Infectious Diseases, Johns Hopkins University School of Medicine, 600 N, Wolfe Street, Phipps 540, Baltimore, MD 21287. E-mail: kpage2@jhmi.edu.

variables and Wilcoxon rank sum test for nonnormally distributed continuous variables. Univariate associations of $P < 0.05$ were considered significant. Multivariate analysis was done by logistic regression. All covariates that had a univariate association with a positive test of $P < 0.15$ were examined into the multivariate model. The final model maintained only those variables with $P < 0.05$. The statistical analysis was performed using SAS version 9.1 (SAS Institute, Cary, NC).

Among 1574 women enrolled in the clinical cohort from January 1996 to January 2006, 1037 (66%) had CT or GC tests performed at least once in the Johns Hopkins Hospital laboratory and results linked to the abstracted medical record. The majority of the tests for both CT (81.9%) and GC (82.2%) were performed using NAATs and the remaining using culture techniques. Women tested for CT or GC were younger ($P < 0.001$), and more likely to be black ($P = 0.04$) or receiving highly active antiretroviral therapy (HAART) ($P < 0.001$) than those who were not tested for CT or GC. The majority of the women were tested for STDs after enrollment in the cohort—only 39 of 1037 (3.8%) of the women were tested for CT or GC at the time of entry into care.

Of the 1037 women tested for CT or GC, 7.1% had a positive test result for either CT or GC. Two of the 39 (5.1%) women tested at the time of entry to care were positive for CT or GC. The prevalence of CT was 3.6% and of GC 4.6%, with 0.9% coinfected with CT and GC. In univariate analysis, a positive CT or GC result as combined outcome was associated with age ≤35 years, HIV viral load between 400 and 10,000 copies/mL, and not receiving HAART. Multivariate analysis adjusting for age, viral load, and HAART identified age ≤35 years as the only risk factor associated with CT or GC infection (Table 1). The prevalence of CT or GC was 16.5% in women <25 years, 8.8% in women aged 25 to 35 years, and 3.9% in women >35 years. Among women less than 25 years, 6.3% had a positive CT result and 10.2% had a positive GC result. Women between 25 and 35 had a prevalence of CT and GC of 4.8% and 5.9%, respectively, whereas women >35 years had a prevalence of CT and GC of 1.9% and 2.4%, respectively. Screening only women <25 years would have detected 18% of the CT and GC cases in our sample; screening only women ≤35 years would have detected 74% of CT and GC cases.

STDs in HIV-infected women have significant implications for individual reproductive health and for ongoing sexual transmission of HIV in the community. Previous studies have identified young age as an important risk factor for incident STD infection in women with known HIV infection.[6,7] In our cohort of women receiving HIV care we also found that age ≤35 years was the strongest risk factor for infection with either CT or GC. However, the high prevalence of CT and GC in all age groups may warrant screening older HIV-infected women as well.

In the United States, the prevalence of CT is significantly higher in women <20 years old than in women between 30 and 39 years old (4.6% vs. 1.9%), but the prevalence of GC is <1% in all age groups.[8] In our cohort, the prevalence of CT in women >35 years old was also relatively low (1.9%), but the prevalence of GC was much higher (2.4%) than in the general population, especially compared with older women (30 –39 years) where the prevalence of GC is 0.07%.[8] Therefore, national screening guidelines based on estimates of STD prevalence in the general population that focus on reproductive health may not be applicable to HIV-infected women. Even if fertility is a lesser priority in older women, infection with CT and GC in HIV-infected women is a marker of high risk behavior and may increase HIV transmissibility.[4]

In our study, the majority of the test results were obtained using NAATs. Although NAATs may have a low positive predictive value for GC in populations with low (<1%) prevalence of GC, it is unlikely that false-positive NAATs resulted in a significant overestimate of the GC prevalence given the high prevalence of GC in Baltimore City and in our cohort.[9,10] Among

women who had GC cultures of the endocervix, 3.8% were positive, consistent with the GC prevalence found by NAATs. The ease of obtaining CT and GC NAATs from a urine or self-collected swab specimen means that testing for both CT and GC might add little cost beyond screening for 1 pathogen. Selective screening in populations with high prevalence of GC will increase the specificity and cost-effectiveness of this approach. Our results suggest that HIV-infected women are an appropriate population to screen for both CT and GC using NAATs.

However, our study was limited to 1 HIV continuity clinic in Baltimore and may not be generalizable to HIV-infected women in other regions. The population in this study was predominantly black and most patients reside in a jurisdiction with very high rates of STDs.[10] Although STD screening of women attending an HIV clinic in New Orleans[11] also found a high prevalence of CT and GC (3.3% and 2.1%, respectively), screening HIV-infected individuals in San Francisco revealed a low prevalence of CT (0.5%) and GC (0%).[12] Therefore, STD screening programs in HIV-infected populations need to be guided by the local epidemiology.

Approximately two thirds of the women enrolled in our HIV clinic were screened for CT or GC. This level of screening is similar to the proportion of women screened in gynecology clinics, but much higher than the proportion screened in primary care medical clinics, where less than one third of patients are tested for STDs.[13,14] Our clinic guidelines recommend baseline STD examination for all patients, but a clinician's decision to test may be based on risk assessment or clinical presentation and therefore unmeasured factors related to testing decisions may have introduced bias. Very few women in our cohort were screened during the first encounter to the clinic. We were unable to evaluate behavioral risk factors or clinical presentations associated with testing because our data had limited behavioral information and did not capture symptoms. In our cohort, women who were older, white, or not receiving HAART were less likely to be tested for CT or GC.

In summary, we found that young age was the only independent risk factor for infection with CT or GC among women receiving HIV continuity care, but prevalence was high in all age groups. These data underscore the importance ongoing assessment of sexual behavior and counseling on risk reduction as part of primary HIV care. Screening for STDs may identify women who may not acknowledge high risk behavior and help target interventions. Treatment of STDs and behavioral risk reduction may decrease HIV transmission in the community. Our data suggest that in areas with high prevalence of STDs, HIV-infected women should be routinely tested for STDs.

Acknowledgements

Supported by the National Institutes of Health RO1 DA11602 and K24 DA 00432.

References

1. Aberg JA, Gallant JE, Anderson J, et al. Primary care guidelines for the management of persons infected with human immunodeficiency virus: recommendations of the HIV Medicine Association of the Infectious Diseases Society of America. Clin Infect Dis 2004;39:609–629. [PubMed: 15356773]
2. U.S. Preventive Services Task Force. Screening for chlamydial infection: Recommendations and rationale. Am J Prev Med 2001;20(S1):90–94.
3. U.S. Preventive Services Task Force. Screening for Gonorrhea: Recommendation statement. Am J Fam Med 2005;3:263–267.
4. Ghys PD, Fransen K, Diallo MO, et al. The associations between cervicovaginal HIV shedding, sexually transmitted diseases and immunosuppression in female sex workers in Abidjan, Cote d'Ivoire. AIDS 1997;11:F85–F93. [PubMed: 9342059]

5. Moore RD. Understanding the clinical and economic outcomes of HIV therapy: The Johns Hopkins HIV clinical practice cohort. J Acquir Immun Defic Syndr Hum Retrovirol 1998;17S(suppl 1):S38–S41.

6. Erbelding EJ, Chung SE, Kamb ML, et al. New sexually transmitted diseases in HIV-infected patients: Markers for ongoing HIV transmission behavior. J Acquir Immun Defic Syndr 2003;33:247–252.

7. Manning SE, Pfeiffer MR, Nash D, et al. Incident sexually transmitted infections among persons living with diagnosed HIV/AIDS in New York City, 2001–2002: A population-based assessment. Sex Transm Dis 2007;34:1008–1015. [PubMed: 17621243]

8. Datta SD, Sternberg M, Johnson RE, et al. Gonorrhea and chlamydia in the United States among persons 14 to 39 years of age, 1999 to 2002. Ann Intern Med 2007;147:89–96. [PubMed: 17638719]

9. Katz AR, Effler PV, Ohye RG, et al. False-positive gonorrhea test results with a nucleic acid amplification test: The impact of low prevalence on positive predictive value. Clin Infect Dis 2004;38:814–819. [PubMed: 14999624]

10. CDC. STD Surveillance, 2005. [Accessed 10/2/07]. 2005 Available at: http://www.cdc.gov/std/stats/

11. Farley TA, Cohen DA, Wu SY, et al. The value of screening for sexually transmitted diseases in an HIV clinic. J Acquir Immun Defic Syndr 2003;33:642–648.

12. Klausner JD, Stanley H, Stansell J. STD screening among HIV-infected patients in care, San Francisco. AIDS Patient Care STDS 2001;15:73–76. [PubMed: 11224932]

13. St Lawrence JS, Montano DE, Kasprzyk D, et al. STD screening, testing, case reporting, and clinical and partner notification practices: a national survey of US physicians. Am J Public Health 2002;92:1784–1788. [PubMed: 12406809]

14. Tao G, Irwin KL. Receipt of HIV and STD testing services during routine general medical or gynecological examinations: Variations by patient sexualrisk behaviors. Sex Transm Dis 2008;35:167–171. [PubMed: 18090177]

TABLE 1

Risk Factors for Either GC or CT Among HIV-Infected Women

	Total	Positive CT	Positive GC	Positive CT/GC	Univariate OR (95% CI)	*P*	Multivariate AOR, 95% CI*
Total	1037	37 (3.6)	46 (4.6)	74 (7.1)	—	—	—
Age							
Mean, SD	34.9 (7.9)	29.1 (6.9)	29.2 (7.2)	29.7 (7.3)	—	—	—
<25	79 (7.6)	5 (6.3)	8 (10.2)	13 (16.5)	5.55 (2.56–12.5)	<0.001	5.00 (2.33–11.11)
25–35	475 (45.8)	23 (4.8)	27 (5.9)	42 (8.8)	2.27 (1.15–4.55)		2.04 (1.02–4.17)
>35	483 (46.6)	9 (1.9)	11 (2.4)	19 (3.9)	Reference	—	Reference
Race							
Black	875 (85.4)	34 (3.9)	38 (4.5)	63 (7.2)	Reference	0.13	—
White	133 (13.0)	2 (1.5)	7 (5.3)	9 (6.8)	0.79 (0.35–1.78)	—	—
Other	16 (1.6)	1 (6.3)	1 (6.7)	2 (12.5)	2.41 (0.52–11.13)	—	—
CD4 count							
<200	319 (32.0)	13 (4.1)	10 (3.4)	19 (6.0)	Reference	0.31	—
200–400	302 (30.3)	8 (2.6)	13 (4.4)	18 (6.0)	1.06 (0.54–2.08)	—	—
>400	376 (37.7)	15 (4.0)	19 (5.3)	32 (8.5)	1.57 (0.86–2.86)	—	—
HIV viral load							
<400	303 (30.8)	6 (2.0)	11 (3.7)	16 (5.3)	Reference	0.03	Reference
400–10,000	254 (25.8)	15 (5.9)	16 (6.5)	27 (10.6)	2.06 (1.11–3.92)	—	1.70 (0.87–3.31)
>10,000	426 (43.3)	14 (3.3)	15 (5.0)	26 (6.1)	1.17 (0.63–2.22)	—	1.01 (0.52–1.93)
HAART							
No	785 (75.7)	31 (3.9)	40 (5.3)	63 (8.0)	Reference	0.05	Reference
Yes	252 (24.3)	6 (2.4)	6 (2.5)	11 (4.4)	0.52 (0.27–1.01)	—	0.60 (0.31–1.19)
HIV risk IVDU							
No	598 (57.7)	26 (4.3)	25 (5.3)	45 (7.5)	Reference	0.57	—
Yes	439 (42.3)	11 (2.5)	21 (5.1)	29 (6.6)	0.87 (0.54–1.41)	—	—
Heterosexual: HIV3 partner							
No	644 (62.1)	24 (3.7)	26 (4.2)	45 (7.0)	Reference	0.81	—
Yes	393 (37.9)	13 (3.3)	20 (5.2)	29 (7.4)	1.06 (0.65–1.72)	—	—
High risk partner							
No	566 (54.5)	18 (3.2)	25 (4.6)	39 (6.9)	Reference	0.74	—
Yes	471 (45.5)	19 (4.0)	21 (4.6)	35 (7.4)	1.08 (0.68–1.74)	—	—

Values expressed as number (percentage) unless otherwise noted. One thousand thirty-seven women were tested for CT and 996 for GC.

Race was missing for 13 individuals, CD4 count was missing for 40 individuals, and HIV viral load was missing for 54 individuals.

Multivariate regression model includes age, viral load, and HAART. OR and AOR are for CT and GC as combined outcomes.

AOR indicates adjusted odds ratio; IVDU, intravenous drug use.