Published in final edited form as:

Sex Transm Dis. 2013 October ; 40(10): 804–807. doi:10.1097/OLQ.000000000000026.

Prevalence and Factors Associated with *Trichomonas vaginalis* Infection among High-risk Women in Los Angeles

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Abstract

Remnant specimen from 1,215 women screening for chlamydia/gonorrhea at four different venue types (STD clinics, home-test kit users, juvenile and adult detention) in Los Angeles, CA, were tested for *T. vaginalis*. Prevalence of *T. vaginalis* varied by screening population and concurrent chlamydia or gonorrhea was independently associated with *T. vaginalis*.

Keywords

Trichomonas vaginalis; epidemiology; women

An estimated 3.7 million people in the United States (US) are currently infected with *Trichomonas vaginalis*, a sexually transmitted infection (STI) caused by the protozoan *T. vaginalis*.¹ The prevalence of *T. vaginalis* infections among sexually active women varies widely with estimates of 5% among women in family planning clinics 10% among women using an internet-based screening program, and as high as 37% among incarcerated women.^{2–5} Clinical signs and symptoms include vaginitis and vaginal discharge, however, it is estimated that the majority of men and about half of women are asymptomatic.^{6–8} This is especially problematic given that untreated *T. vaginalis* is associated with serious health consequences including preterm birth, low birth weight, infertility, pelvic inflammatory disease and increased risk of HIV.^{9–13}

Although *T. vaginalis* is the most common curable STI in the US, it continues to be overlooked and underdiagnosed.¹⁴ Identifying factors associated with *T. vaginalis* will serve

as key evidence needed for targeted screening recommendations. The objective of this study was to determine the prevalence and correlates of *T. vaginalis* using newly available and highly sensitive nucleic acid amplification tests (NAATs) in multiple populations of high-risk women. We used remnant specimen collected from September–December 2010 from women being screened for chlamydia/gonorrhea at four different venue types in Los Angeles County, CA including: (1) public STD clinics (n=12); (2) an internet-based home-testing program (www.dontthinkknow.org); (3) an adult correctional facility; and (4) a juvenile detention facility. The study population varied at each venue type such that chlamydia/gonorrhea testing was conducted in females entering juvenile hall (ages 11–18), females seen at the STD clinics (12 and over), and females using the home test kit (ages 12–25). In the jail setting, however, women ages 18–30 years were routinely screened for chlamydia/gonorrhea, whereas women over 30 were only screened if they were possibly pregnant or incarcerated on a sex-related charge. The remnant specimens used for routine chlamydia/gonorrhea NAATs were tested using the APTIMA *Trichomonas vaginalis* assay (Hologic/Gen-Probe, San Diego, CA).

Some of the data for this project were collected as part of a larger study and details have been previously described.⁴ Our study includes additional data, including data from girls < 18 years of age and additional behavioral information from women tested in STD clinics. Differences between groups were evaluated using t-tests, chi-square methods, and associations between *T. vaginalis* and other factors were evaluated using logistic regression analysis. All analyses were conducted using SAS version 9.2 (SAS Institute Inc., Cary, NC). This study was approved by the human subjects committee at the Los Angeles County Department of Public Health and the University of California Los Angeles.

A total of 1,215 remnant specimens from women undergoing routine chlamydia/gonorrhea screening were tested for *T. vaginalis*. The prevalence of *T. vaginalis* varied by venue type, with the highest prevalence noted among women testing through jail (22%), followed by the STD clinics (17%) and lowest among women using home-test kits (7%)(Table 1).

Regardless of venue, the prevalence was higher among women with a concurrent chlamydia or gonorrhea infection, though the pattern varied by venue. For instance, among women in STD clinics, the prevalence of *T. vaginalis* was 80% among those co-infected with gonorrhea as compared to 16% among those without gonorrhea (p value <.01). Even after adjusting for age and race/ethnicity, women at the STD clinics with a concurrent gonorrhea infection were more than fourteen times as likely to have *T. vaginalis* when compared to those without gonorrhea (adjusted odds ratio (AOR)=14.28; 95% confidence interval (CI) 2.23–91.71). Chlamydia co-infections were independently associated with *T. vaginalis* among girls in juvenile detention (AOR=5.60; 95% CI 2.40–13.07) (Table 1).

Based on behavioral information available for women testing at STD clinics we found that the prevalence of *T. vaginalis* varied by risk behaviors, with a lower prevalence among women with a new sex partner (10% vs. 20% in women with no new sex partner; p value=0.04) and higher prevalence among women reporting substance use (31% vs. 12% in non-users; p value<.01)(Table 2). Based on multivariable analysis, these factors were independently associated with *T. vaginalis* infection with women with a new sex partner less likely to test positive for *T. vaginalis* (AOR=0.35; 95% CI 0.15–0.84) and those with

substance use more likely to test positive for *T. vaginalis* (AOR=3.14; 95% CI 1.57–6.30) (Table 1).

The use of highly sensitive testing technology (NAATs) allowed us to improve our understanding of the epidemiology of *T. vaginalis* across the different at-risk groups of women, including girls testing through a juvenile detention facility, a unique population not described before. We found that the prevalence of *T. vaginalis* was relatively high across all chlamydia/gonorrhea screening populations and certainly higher than the prevalence estimates of 3.2% among women in the US.¹ We also found substantial co-infections with chlamydia or gonorrhea and *T. vaginalis* across the different study populations. Findings in the literature on concurrent chlamydia/gonorrhea infections are mixed, however, two studies conducted in a clinical setting concur with our findings.^{2,15–17} This implies that there may be intersecting sexual networks, with high transmission probabilities for *T. vaginalis* among certain populations of women with gonorrhea or chlamydia. Moreover, these data suggest that testing and/or presumptive treatment for *T. vaginalis* may be indicated in women treated for gonorrhea in STD clinics or jails as well as girls treated for chlamydia in a juvenile detention. This study also adds to the evidence of others showing an association between *T. vaginalis* infections and incarceration among women.^{18–20} As incarcerated women often have higher risk sexual networks and are at increased risk of HIV infection, the diagnosis and treatment of *T. vaginalis* infections in this setting should be a high priority.

Interestingly, our results showed that women who reported a new sex partner were less likely to test positive for *T. vaginalis*. In trying to understand this association we explored differences between those who reported a new sex partner to those who did not and found that women who had no new sex partners were older and more likely to report unprotected sex (48% never using condoms vs. 24%). Condom use was not consistently assessed (>30% missing) and therefore this limits our interpretations. However, these findings may support other data that suggests that the risk of STI transmission may be increased in the context of regular partnerships given that condom use in this context is usually lower.²¹

Several study limitations should be mentioned. *T. vaginalis* tests were performed on specimen collected as part of routine chlamydia/gonorrhea screening. Women in the older age groups (>26 years in clinics and >30 years in jail) were likely tested because of symptoms, contact with a positive partner, etc. and potentially at higher risk. This could result in an overestimation of the true prevalence of *T. vaginalis* in this group and may bias the association between *T. vaginalis* and gonorrhea co-infections. However, in limiting our analysis to younger women in jail and the STD clinics, we found that the prevalence of *T. vaginalis* still remained significantly higher among younger women co-infected with gonorrhea (data not shown). Nevertheless, this study demonstrates that *T. vaginalis* is a common infection across varied populations of women. These findings highlight the need for targeted *T. vaginalis* screening recommendations and suggest that testing and/or presumptive *T. vaginalis* treatment should be considered in a subset of women particularly in women treated for gonorrhea in jail or STD clinic settings and chlamydia in juvenile detention settings.

Acknowledgments

This manuscript represents the views of the authors and does not necessarily represent the views of the Department of Public Health or Los Angeles County.

The authors' sincere appreciation goes to Melina Boudov, Marisol Mejia, LaShawnda Royal, Apurva Uniyal, Jennifer Vonghack, and Peter Kerndt from the Los Angeles County Department of Public Health, Division of HIV and STD Programs. We also thank Taylor Mundt and Joan Sturgeon from the Los Angeles County Public Health Laboratory and Linda Harshman, Craig Hill, and Janet Snook from Hologic/Gen-Probe.

FUNDING

MJ was supported by a grant from the National Institutes of Health (NIH)/National Institutes of Allergy and Infectious Diseases (NIAID) (grant number K01AI091861). This research was supported by donations of reagent from Hologic/Gen-Probe Incorporated.

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SUMMARY

In an observational study among women screening for chlamydia/gonorrhea we found that the prevalence of *T. vaginalis* infections was relatively high and varied by risk behaviors and concurrent STI status.

Table 1

Prevalence and factors associated with *T. vaginalis* infections among women by testing venue, Los Angeles County, CA, September-December 2010

	Home-test Kit (n=137)			Jail (n=358)			Juvenile Hall (n=349)			STD Clinics (n=371)		
	<i>T. vaginalis</i> Positive n (%)	Adjusted OR (95% CI)	<i>T. vaginalis</i> Positive n (%)	Adjusted OR (95% CI)	<i>T. vaginalis</i> Positive n (%)	Adjusted OR (95% CI)	<i>T. vaginalis</i> Positive n (%)	Adjusted OR (95% CI)	<i>T. vaginalis</i> Positive n (%)	Adjusted OR [^] (95% CI)		
Total	10 (7.3)	-	78 (21.8)	-	29 (8.3)	-	64 (17.3)	-	-	-		
Age												
11–19	1 (3.5)	-	4 (22.2)**	1.00 (Reference)	29 (8.3)	-	13 (23.2)	-	1.00 (Reference)			
20–24	6 (7.5)	-	28 (17.8)	0.82 (0.24–2.79)	-	-	16 (20.0)	-	1.13 (0.38–3.42)			
25–29	3 (10.7)	-	25 (20.8)	1.17 (0.34–4.00)	-	-	9 (14.3)	-	0.98 (0.30–3.21)			
30–39	-	-	11 (25.0)	1.38 (0.36–5.26)	-	-	9 (10.3)	-	0.69 (0.23–2.11)			
40+	-	-	10 (52.6)	5.55 (1.25–24.76)	-	-	17 (20.0)	-	1.51 (0.55–4.18)			
Race/ethnicity												
African American	8 (26.7)**	9.09 (1.05–78.54)	46 (33.1)**	2.90 (1.34–6.25)	22 (15.6)**	0.70 (0.20–2.40)	53 (24.2)**	4.78 (0.97–23.60)				
Hispanic	1 (2.1)	0.53 (0.03–8.87)	19 (13.8)	0.91 (0.39–2.08)	3 (1.7)	0.08 (0.02–0.40)	7 (7.6)	1.37 (0.23–8.18)				
Other	0 (0.0)	--	1 (6.7)	0.48 (0.06–4.08)	0 (0.0)	-	2 (7.7)	2.59 (0.30–22.38)				
White	1 (3.9)	1.00 (Reference)	12 (18.2)	1.00 (Reference)	4 (17.4)	1.00 (Reference)	2 (5.9)	1.00 (Reference)				
Chlamydia infection												
Yes	1 (10.0)	-	13 (34.2)*	-	14 (26.9)**	5.60 (2.40–13.07)	9 (25.0)	-				
No	9 (7.1)	-	65 (20.4)	-	15 (5.1)	1.00 (Reference)	55 (16.4)	-				
Gonorrhea infection												
Yes	1 (50.0)**	-	5 (41.7)	3.52 (1.01–12.37)	2 (28.6)*	-	8 (80.0)**	14.28 (2.23–91.71)				
No	9 (6.7)	-	73 (21.1)	1.00 (Reference)	27 (7.9)	-	56 (15.5)	1.00 (Reference)				

Abbreviations. OR=Odds ratio; CI=Confidence Interval

* p<.05;

** p<.01

[^] model adjusts for factors listed as well as substance use (AOR=3.14; 95% CI 1.57-6.30) and having a new sex partner (AOR=0.35; 95% CI 0.15-0.84)

Table 2

Prevalence of *T. vaginalis* by demographics, risk behaviors, and symptoms among women tested at public STD clinics in Los Angeles County, CA September-December, 2010 (n=371)

	<i>T. vaginalis</i> Positive		P value
	n*	%	
Total	64	17.3	--
Demographics			
Age			0.33
12–19	13	23.2	
20–24	16	20.0	
25–29	9	14.3	
30–39	9	10.3	
40+	17	20.0	
Race/Ethnicity			<.01
African American	53	24.2	
Hispanic	7	7.6	
Other	2	7.7	
White	2	5.9	
Sexual Risk Behaviors			
Gender of sex partners			0.06
Males only	55	16.3	
Males and Females	6	37.5	
Females only	2	33.3	
Number of sex partners, past 3 months			0.23
0	2	11.8	
1	41	16.5	
2–3	14	17.5	
>3	6	35.3	
New sex partner, past 3 months			0.04
Yes	9	10.1	
No	41	19.6	
Vaginal douching			0.15
Yes	22	22.0	
No	31	15.3	
Hormonal contraception			0.72
Yes	6	15.4	
No	57	17.7	
Exchange drugs/money for sex, past 12 months			0.14
Yes	4	33.3	
No	59	16.7	
Incarcerated, past 12 months			0.70
Yes	2	22.2	

	<i>T. vaginalis</i> Positive		P value
	n*	%	
No	61	17.3	
Sex partner incarcerated, past 12 months			0.09
Yes	7	30.4	
No	56	16.5	
Injection drug use, past 12 months			0.50
Yes	1	33.3	
No	60	18.0	
Sex partner injection drug use, past 12 months			0.22
Yes	1	50.0	
No	62	17.2	
Substance use, past 12 months**			<.01
Yes	34	31.2	
No	29	11.5	
Symptoms, Signs, and Clinical Assessments			
<i>Symptoms</i>			
Abdominal pain			0.28
Yes	8	24.2	
No	55	16.8	
Abnormal vaginal bleeding			0.70
Yes	2	22.2	
No	61	17.3	
Dyspareunia			0.36
Yes	0	0.0	
No	63	17.7	
Dysuria			0.84
Yes	4	16.0	
No	59	17.6	
Urethral discharge			0.69
Yes	1	25.0	
No	62	17.4	
Vaginal discharge and/or odor			0.01
Yes	36	23.1	
No	27	13.2	
Vulval itch			0.08
Yes	21	23.6	
No	42	15.4	
<i>Clinical Assessments and Signs</i>			
Abnormal vaginal or cervical exam			<.01
Yes	49	23.7	
No	9	8.9	
Bacterial vaginosis			<.01

	<u><i>T. vaginalis</i> Positive</u>		P value
	n*	%	
Yes	28	26.9	0.17
No	35	13.6	
Vaginitis			0.11
Yes	8	26.7	
No	55	16.6	0.11
Yeast			
Yes	7	10.6	0.20
No	56	18.9	
Laboratory testing results			
Chlamydia infection			0.20
Yes	9	25.0	
No	55	16.4	<.01
Gonorrhea infection			
Yes	8	80.0	0.67
No	56	15.5	
Syphilis positive (TPPA)			0.67
Yes	3	23.1	
No	57	18.3	0.22
HIV positive			
Yes	1	50.0	0.22
No	57	18.0	

Abbreviations. OR=Odds Ratio; CI=Confidence Interval

* sum may not equal total due to missing data

** substance use includes cocaine, crack, heroin, marijuana, and methamphetamine