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Detection of Three Sexually Transmitted Infections by Anatomic Site: Evidence from an Internet-based Screening Program

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Abstract

Urogenital and rectal specimens collected from the 'IWantTheKit' internet-based STI screening program were evaluated for *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Trichomonas vaginalis*. Of 881 paired specimens submitted from August 2013-December 2016, 15.0% (n=132) tested positive for one or more STIs, of which 50.8% (n=67) were identified exclusively through rectal testing.

SUMMARY

Assessment of dual samples (rectal and urogenital) from an internet-based STI screening program estimated that approximately 51% of infections would have been missed through urogenital-only testing.

Keywords

chlamydia; gonorrhea; trichomonas; rectal infections

INTRODUCTION

Chlamydia trachomatis (CT), *Neisseria gonorrhoeae* (NG), and *Trichomonas vaginalis* (TV) are common sexually transmitted infections (STIs). The majority of infections show no symptoms that might prompt one to seek treatment. This characteristic promulgates transmission and increases the likelihood for reproductive health complications.[1–3] The high proportion of asymptomatic STIs supports screening for high-risk populations. There is ongoing discussion regarding expansion of screening to include rectal testing, which is not commonly performed in the absence of symptoms such as pain, bleeding or discharge. Instead, rectal screening is typically provided by exception for high-prevalence clinic

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settings and populations such as men who have sex with men (MSM). Practitioners are re-evaluating this screening practice as data accumulate regarding the frequent occurrence of rectal infections and a concerning level of missed infections in diverse groups.[4–7] There remains a need for studies of rectal STIs in populations outside reproductive health and STD clinics to inform screening guidelines.

The 'I Want The Kit' (IWTK) program, an internet-based screening program established in 2004, serves as one such population, capturing individuals who opt for STI self-testing outside these clinic settings. The program offers free, confidential urogenital and rectal testing for CT, NG, and TV via self-collection swab kits.[8–11]The program has been shown to be a successful, cost-effective means of screening and treating STIs in men and women.[10,12–14] The program also includes an educational component which informs users about STIs and uses a short, validated online quiz to estimate an individual's STI risk.[15–16]

Rectal testing in this program was introduced in 2009, based on the high prevalence (44%) of reported rectal sex among IWTK users.[17] A study of 205 females using IWTK for urogenital and rectal testing from January 2009 - February 2011, revealed a high prevalence of rectal specimens positive for STIs (18.5% for CT, NG or TV) and that 29.4% with rectal STIs had negative vaginal specimens and would not have been diagnosed in the absence of rectal testing.[17]

This study expands upon prior analyses of the IWTK user population by examining a larger cohort of both male and female IWTK users. The study objectives were to examine the distribution of CT, NG, and TV by anatomic site, and to quantify infections which would have been missed without rectal testing. Examination of this population helps to address knowledge gaps, particularly for TV for which there is a paucity of information regarding rectal testing, and the results help to describe a unique patient population that is becoming increasingly important as internet-based testing grows in popularity.

MATERIALS AND METHODS

Through the IWTK website participants ordered penile, vaginal, and rectal test kits. Returned kits were tested by the Johns Hopkins University (JHU) laboratory using nucleic acid amplification tests (NAAT), Aptima Combo 2 for CT and NG, and Aptima TV for TV (Gen-Probe/Hologic, San Diego, CA, USA). Positive results were shared with the participant along with the participant's chosen clinic to facilitate access to timely treatment. Analysis of de-identified IWTK data was deemed to be exempted from human subjects' research by the JHU Institutional Review Board.

Statistical analyses of data collected from participants in Maryland and Washington, DC, during August 1, 2013 – December 31, 2016 were performed using SPSS version 21.0. August 2013, was chosen as the starting point because it marked implementation of programmatic changes including automated test result access.[18] Only paired specimens (i.e., urogenital and rectal specimens submitted from the same participant) were included in the analyses. Additionally, specimens for which one or more of the three STIs tested had no definitive laboratory results were excluded.

Variance in STI infections by sex and specimen source (urogenital versus rectal) was examined, and statistical significance was evaluated using Pearson chi-square tests. Infections missed in the absence of rectal testing were evaluated by examining the proportion of positive tests identified exclusively through rectal testing.

RESULTS

Of 3,191 kits submitted, 3,186 returned definitive results for all three STIs, from which a total of 2,281 (71.6%) included only urogenital swabs, 24 (0.8%) included only rectal swabs, and 881 (27.7%) included both rectal and urogenital swabs. Overall, 10.7% of 3,191 submitted specimens were positive for one or more STIs (6.5%, 1.3%, and 3.9% for CT, NG, and TV, respectively).

Among the 881 paired submissions retained for the analysis, roughly half were submitted by women (52.4%). Black, non-Hispanics provided 41.0% of specimens, followed by White, non-Hispanics (34.7%). Participants were on average 29 years of age (29.1 years +/− 8.8). A higher proportion of men and non-Black IWTK users submitted rectal swabs compared to women and Black participants, respectively (32.7% of men: 25.2% of women; 30.8% of non-Black: 25.5% of Black; $p<0.05$).

Of the 881 paired kits, 132 (15.0%) were positive for one or more STIs (8.3% CT, 3.2% NG, and 5.5% TV) [TABLE]. CT was common in men and women (9.3% and 7.4%, respectively). NG positive specimens were more common in men compared to women (6.4%:0.2%, $p<0.05$), while TV specimens were more frequently positive in women (9.9%:0.7%, $p<0.05$). There were a total of 17 coinfections (9 CT/TV and 8 CT/NG).

Overall, testing from dual anatomic sites revealed that 50.8% (67/132) of STIs were identified exclusively in the rectum, and would have been missed with urogenital testing alone. There was considerable variability in the site of detection by pathogen with 92.9% (26/28) of NG cases identified exclusively in the rectum compared to 46.6% (34/73) for CT and 43.8% (21/48) for TV [TABLE]. In general, more STIs would have been missed in the absence of rectal testing among men as compared to women (65.0% versus 38.4%, $p=0.08$). Most (93–100%) NG infections were identified in both sexes exclusively through rectal testing.

DISCUSSION

Overall, 10.7% of 3,191 specimens submitted were positive for one or more STIs. The prevalence of positive specimens from 881 paired rectal and urogenital specimen kits was higher (15.0%). Evaluation of positive laboratory results revealed that half (50.8%) of infections where both urogenital and rectal samples were provided would have been missed in the absence of rectal testing. Missed infections varied by sex and pathogen with the following proportions of STIs identified exclusively from rectal tests: 92.6% of male NG positives and 100% of female NG positives; 53.8% of male CT positives and 38.2% of female CT positives; and 66.7% of male TV positives and 42.2% of female TV positives. However, these variations by sex were not statistically significant.

These findings are consistent with other published studies as described in a recent literature review depicting a large burden of rectal CT and NG infections among women, MSM, and men who have sex with women (MSW), and considerable variability in detection by anatomic site.[4] Among women, the median reported prevalence of rectal CT and NG was estimated at 8.7% and 1.9%, respectively. Among MSM, the median reported prevalence of rectal CT and NG was estimated at 8.9% and 5.9%, respectively. Among MSW, the median reported prevalence of rectal CT and NG was estimated at 7.7% and 3.4%, respectively.[4]

A growing number of reports highlight infections that are missed in the absence of extra-genital testing. Among MSM, for example, over 70% of extra-genital CT/NG infections in a sample of nearly 22,000 patients across 42 U.S. STD clinics would have been missed had testing been limited to urogenital specimens.[6] This is consistent with other studies in the MSM population where 79.6% of chlamydia and 76.5% of gonorrhea infections were detected exclusively in the pharynx or rectum.[5] Among women, an estimated 14–44% of chlamydia and 25–30% of gonorrhea infections would have been missed without extra-genital testing.[5,7,17,19–20] Similarly, numerous studies have demonstrated that extra-genital screening at rectal or pharyngeal sites increases detection of chlamydia or gonorrhea among women by 6–50%.[4]

There are limitations to this study. Personal identifiers were not available; therefore, results were specimen-based rather than person-based, which prevented evaluation of incident and repeat infections. Additionally, risk assessment questions from which exposures could be ascertained were not available. Thus, the presence of rectal TV identified in 3 men, a rare finding, could not be explored further to determine if the findings were indicative of underlying bisexual behavior or a false positive test result. Also, because the specimens were self-collected, cross-contamination by the participant is possible. The power of the study was also limited by the low number of rectal specimens submitted, with dual urogenital and rectal testing available for only 27.7% of returned testing kits. Furthermore, pharyngeal specimens were not collected, which prevented examination of variations in detection for the full spectrum of extra-genital infections. Lastly, selection bias is possible, i.e., the study is not representative of the general population as participants are self-selected based on program awareness and need.

Despite these limitations, the high burden of disease identified through the program suggests that the IWTK program remains an effective means of screening and treating a high-risk user group. Additionally, our results demonstrate the value added by offering rectal testing. The IWTK program should encourage participants at high risk to submit both urogenital and rectal specimens, and the option of submitting pharyngeal swabs should be offered to IWTK users.

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Table.

Specimen Positivity by Sex, Pathogen and Anatomic Site

	Urogenital-Only Positive # (%)	Rectal-Only Positive # (%)	Positive on Both # (%)	Total Positive # (%)	%Missed without Rectal Testin^
Females (N=462):					
Chlamydia	12 (2.6)	13 (2.8)	9 (1.9)	34 (7.4)	38.2
Gonorrhea	0 (0.0)	1 (100.0)	0 (0.0)	1 (0.2)	100.0
Trichomonas	22 (4.8)	19 (4.1)	4 (0.9)	45 (9.9)	42.2
*Any of the above	29 (6.3)	28 (6.1)	15 (3.2)	72 (15.6)	38.4
Males (N=419)					
Chlamydia	17 (4.1)	21 (5.0)	1 (0.2)	39 (9.3)	53.8
Gonorrhea	2 (0.5)	25 (6.0)	0 (0.0)	27 (6.4)	92.6
Trichomonas	0 (0.0)	2 (0.5)	1 (0.2)	3 (0.7)	66.7
*Any of the above	8 (4.3)	9 (9.3)	(0.7)	0 (14.3)	5.0
Total (N=881)					
Chlamydia	29 (3.3)	34 (3.9)	10 (1.1)	73 (8.3)	46.6
Gonorrhea	2 (0.2)	26 (3.0)	0 (0.0)	28 (3.2)	92.9
Trichomonas	22 (2.5)	21 (2.4)	5 (0.6)	48 (5.5)	43.8
*Any of the above	47 (5.3)	67 (7.6)	18 (2.0)	132 (15.0)	50.8

^%Missed=#Identified exclusively through rectal testing/Total # Identified through rectal or urogenital testing

*Results for Any STI differ from the summation of individual STI results due to coinfections (n=17: 9 CT/TV coinfections and 8 CT/NG coinfections)