Epidemiological Analysis of Chlamydia Trachomatis and Neisseria Gonorrhoeae in Saskatoon Health Region

Mark Lemstra, MSc, DSc[1]
Cory Neudorf, MD, FRCPC, MHSc[2]
Johnmark Opondo, MD, MPH[3]
Pam de Bruin, BScN[4]
Karen Grauer, BScN, MCEd[5]
Judith Wright, MSc[6]

ABSTRACT

Background: The incidence rates of Chlamydia trachomatis (Ct) and Neisseria gonorrhoeae (GC) in Saskatoon Health Region are approximately double the national average. A descriptive study was designed to try to determine why.

Methods: The objectives of the study were: 1) to determine whether or not the introduction of a new detection method that is less invasive and more sensitive led to more tests being ordered and a higher percentage of positive cases; 2) to determine what percentage of physicians and STI clinic nurses notified Public Health within 72 hours of suspected Ct or GC; 3) to determine what percentage of physicians and STI clinic nurses listed sexual contact information; and 4) to compare recurrence rates between patients treated by physicians and STI clinic nurses.

Results: The number of tests ordered for Ct and GC increased substantially from 10,425 in 1998 to 28,885 in 2003, while the percentage of positive cases decreased from 7.2% to 3.6%. Only 1.3% of physicians and 9.1% of STI clinic nurses notified Public Health within 72 hours of a suspected case. 51.2% of physicians listed sexual contact information in comparison to 85.4% of STI clinic nurses. Recurrence rates of Ct or GC within one year of initial treatment were 26% lower for patients treated by STI clinic nurses (5.7%) than for physicians (7.2%).

Conclusions: There is a need for additional education for health care providers in the management of sexually transmitted infections in Saskatoon Health Region.

MeSH terms: Chlamydia trachomatis; Neisseria gonorrhoeae; public health; management

La traduction du résumé se trouve à la fin de l'article.

Saskatoon Health Region
1. Senior Research Epidemiologist
2. Chief Medical Health Officer and Vice President Research
3. Deputy Medical Health Officer
4. Supervisor, Sexual Health
5. Manager, Healthy Lifestyles
6. Epidemiologist

Correspondence and reprint requests: Dr. Mark Lemstra, Senior Research Epidemiologist, Saskatoon Health Region, 101-310 Idylwyld Drive N, Saskatoon, SK S7L 0Z2, Tel: 306-655-4449, Fax: 306-655-4414, E-mail: mark.lemstra@saskatoonhealthregion.ca

After years of decline, there has been an increase in the reported cases of Chlamydia trachomatis (Ct) and Neisseria gonorrhoeae (GC) in Canada.[1] Ct incidence has steadily increased from a low of 115.9 cases per 100,000 population in 1996 to 197.1 cases per 100,000 population in 2004.[2] GC incidence has also increased from a low of 14.9 cases per 100,000 population in 1997 to 28.9 cases per 100,000 population in 2004.[2] In 2000, Saskatchewan became the province with the highest incidence of Ct per 100,000 population.[2] In 2002, Saskatchewan also became the province with the highest incidence of GC per 100,000 population.[2] Saskatoon Health Region is the largest health region in Saskatchewan and is responsible for the largest absolute number of cases of Ct and GC (Table I).

One possible explanation that has been suggested for the increase in incidence of sexually transmitted infections across Canada has been the introduction of non-invasive urine testing and nucleic acid amplification techniques using polymerase chain reaction (PCR).[1-4] PCR testing has greater sensitivity (94-99%) and specificity (98-100%) in comparison to traditional enzyme immunoassay sensitivity (60-65%) and specificity (75-95%).[3] A study in Nova Scotia determined that the conversion to PCR testing increased the number of positive tests from 3.3% to 4.8%.[4]

The timely and accurate reporting of sexually transmitted infections is also an integral component of successful disease control efforts in order to identify and locate sexual contacts who may be infected.[5] Contact tracing is the process of gathering information from a person with a sexually transmitted infection about their sexual partners in order to help arrange for evaluation and treatment of those partners.[5]

Prevention counselling that includes risk reduction information (i.e., why and how to use condoms) is another important case management strategy. Prevention counselling is known to be effective in reducing the occurrence of new infections among sexually transmitted infection patients by 25-40%.[5]

In order to understand the rising incidence of sexually transmitted infections, a descriptive study was carried out to determine which case management variables were associated with high incidence of

Chlamydia trachomatis and Neisseria gonorrhoeae in Saskatoon Health Region.

METHODS

Notifications of Chlamydia trachomatis (Ct) and Neisseria gonorrhoeae (GC), positive lab reports and case management information are all electronically stored at Population Health Surveillance in the Saskatoon Health Region (Saskatoon). This electronic file was manually cross-checked against patient lab reports and notification forms to validate information stored. An epidemiologist and two health information management professionals were involved in data verification and cleaning. Information was gathered from the years 1998 to 2003. A second case of Ct or GC that was diagnosed within thirty days of an original diagnosis was removed from the analysis. Data on the original number of lab tests ordered was provided directly from the only lab in Saskatchewan.

In June of 2000, the province of Saskatchewan made the administrative decision to switch from the ELISA test procedure to exclusively use the Polymerase Chain Reaction (PCR) test procedure for the diagnosis of Ct and GC. At the same time, urine specimens were used almost exclusively in comparison to swabs. The first objective was to determine whether or not the introduction of a new detection method that is less invasive and more sensitive led to more tests being ordered and a higher percentage of positive cases. The authors reviewed overall tests ordered and positive test counts in Saskatoon and used a comparison group from the health region in Regina. The Regina Health Region (Regina) has similar population size (N = 242,827 in 2003) to Saskatoon (N = 282,979 in 2003) and initiated the PCR urine test procedure at the same time as Saskatoon.

The second objective was to determine what percentage of physicians and STI clinic nurses notified Public Health within 72 hours of suspected Ct or GC. In Saskatchewan, physicians and nurses must report within 72 hours any person suspected of being infected with Ct or GC to a public health officer (category 2 communicable disease, The Public Health Act, 1994[6]). Given the vagueness of terms within the Act, like "suspected" and "after forming an opinion", we used two start times for 72 hours in our study. The first was notification within 72 hours of when a lab test was ordered (suspected case) and the second was notification within 72 hours of a positive lab result (confirmed case).

In Saskatchewan, the Public Health Act also mandates that physicians and nurses ask for information necessary to control the spread of disease, including names, telephone numbers and addresses of the patient's sexual contacts.[6] The third objective was to determine what percentage of physicians and STI clinic nurses listed sexual contact information, what percentage of sexual contacts could be located and what percentage of sexual contacts located tested positive for Ct or GC.

Given that STI clinic nurses spend 45 minutes on assessment, education and prevention counselling for each patient, recurrence rates within one year of initial occurrence were compared between patients treated by physicians and STI clinic nurses.

Ethics approval was obtained by the University of Saskatchewan Behavioural Research Ethics Board.

TABLE I

Incidence of Chlamydia Trachomatis and Neisseria Gonorrhoeae in Saskatoon Health Region, the Province of Saskatchewan and Canada per 100,000 Population from 1998 to 2003

	Chlamydia Trachomatis			Neisseria Gonorrhoeae		
Year	Saskatoon	Saskatchewan*	Canada*	Saskatoon	Saskatchewan*	Canada*
1998	225.2	234.1	129.0	38.9	31.8	16.1
1999	244.6	259.0	138.2	38.5	29.4	17.6
2000	283.4	287.3	150.9	41.2	45.5	20.1
2001	277.5	317.0	161.4	51.3	53.1	21.8
2002	321.1	362.8	179.4	51.5	56.1	23.5
2003	316.6	377.0	189.4	41.0	54.7	26.0

* Source = reference 2 (PHAC, 2004)

TABLE II

Chlamydia Trachomatis and Neisseria Gonorrhoeae Combined Incidence Rate per 100,000 Population, Overall Testing Counts, Positive Lab Counts and Percentage Positive between Saskatoon Health Region and Regina Health Region

	Incidence Rate per 100,000 Population		Tests Ordered		Positives (% Positive)	
Year	Saskatoon	Regina	Saskatoon	Regina	Saskatoon	Regina
1998	266.2	202.0	10,425	9,272	752 (7.2%)	500 (5.4%)
1999	286.0	247.9	12,257	11,319	825 (6.7%)	620 (5.5%)
2000	326.4	303.0	18,758	18,531	926 (4.9%)	744 (4.0%)
2001	340.0	331.5	22,330	20,229	973 (4.3%)	818 (4.0%)
2002	373.6	355.8	25,245	20,704	1074 (4.3%)	878 (4.2%)
2003	372.1	424.6	28,885	22,960	1053 (3.6%)	1031 (4.5%)

TABLE III

Percentage of Physicians and STI Clinic Nurses Who Notified Public Health Within 72 Hours of Suspected and Confirmed Chlamydia Trachomatis or Neisseria Gonorrhoeae Infection from 1998 to 2003

Initial Practitioner	# Patients	Notification Within <72 Hours of Suspected Case	Notification Within <72 Hours of Confirmed Case
Physician	3039	41 (1.3%)	2300 (75.7%)
STI Clinic Nurse	1571	143 (9.1%)	1571 (100.0%)

RESULTS

Detection methods

Saskatoon and Regina introduced PCR testing and urine specimens at the same time in June of 2000. In Saskatoon, the number of tests ordered for Ct and GC increased substantially from 10,425 in 1998 to 28,885 in 2003. In Regina, testing counts also increased considerably from 9,272 lab tests in 1998 to 22,960 in 2003. The largest increase in tests ordered in both cities occurred in 2000 with the introduction of PCR and urine specimens. Despite similar disease counts (1,053 in Saskatoon and 1,031 in Regina in 2003), Saskatoon health care practitioners ordered

approximately 6,000 more tests in 2003 than did Regina health care practitioners. The percentage of positive cases in Saskatoon decreased from 7.2% in 1998 to 3.6% in 2003 while the percentage of positive cases remained more constant in Regina from 5.4% in 1998 to 4.5% in 2003 (Table II).

Case management challenges

There were 5,603 lab-confirmed positive cases of Ct or GC in Saskatoon from 1998 to 2003. Females made up 64.9% of the incidence cases of Ct (standard error 2.9) and 49.6% of the incidence cases of GC (standard error 6.3). The mean age of the incidence cases of Ct was 22.6 (standard deviation 6.5) and 25.1 for GC (standard deviation 9.8).

Of the 5,603 incidence cases of Ct or GC from 1998 to 2003, 3,039 (54%) were initially seen by a physician, 1,571 by an STI clinic nurse (28%), and 993 (18%) by another source (prison or primary care nurse). Of the 3,039 cases who had initial contact with a physician, only 41 were reported to Public Health within 72 hours of a suspected infection (1.3%; 95% CI 0.9-1.8). The percentage of physicians who notified Public Health within 72 hours of positive test confirmation from the lab was 75.7% (95% CI 73.1-78.4). Additional time did not result in extra notifications. The mean duration of time between a physician ordering a test, confirmation of a positive lab result and notification of Public Health was 15.3 days (median 13.0 days). Only 143 out of 1,571 patients initially seen by an STI clinic nurse were reported to Public Health within 72 hours of a suspected case (9.1%; 95% CI 7.6-10.6). One hundred percent of the patients seen by the STI clinic nurse were reported to Public Health within 72 hours of a confirmed lab case (Table III).

From 1998 to 2003, 4,610 patients with Ct or GC were initially seen by a physician (3,039) or an STI clinic nurse (1,571). Of those, sexual contact information was obtained from 51.2% (95% CI 49.0-53.4) vs. 85.4% (95% CI 81.1-89.7) of patients by physicians and STI clinic nurses, respectively. As such, sexual contact information was provided on 2,853 patients with confirmed Ct or GC out of a possible 4,610. Of 2,853 sexual contacts listed, 1,765 were located. Of those 1,765, 464 had a positive test result (26.2%; 95% CI- 23.9-28.7), 541 had a negative test result, 245 refused to be tested and 515 agreed to be tested but did not present for testing. Of sexual contacts located and tested, 464 out of 1,005 (46.2%; 95% CI 43.3-49.0) tested positive for Ct or GC.

Recurrence rates of Ct or GC within one year of initial visit were compared between patients primarily treated by physicians vs. STI clinic nurses. Out of 3,039 cases treated by physicians, 220 (7.2%) patients developed a recurrence within one year from the initial date seen. Out of 1,737 cases treated by STI clinic nurses, 100 patients developed a recurrence within one year (5.7%). The relative risk was 1.26 (95% CI 1.00-1.58).

DISCUSSION

Canada has seen increases in the incidence of both Chlamydia trachomatis (Ct) and Neisseria gonorrhoeae (GC) in the past few years. The rate of increase in Saskatoon and Saskatchewan, in comparison to Canada, has remained proportional throughout with incidence rates that are approximately double the national average.

In Saskatoon, the introduction of PCR and urine testing resulted in significant increases in the number of tests ordered for Ct and GC, but the percentage of positive lab test results reduced by 50% (7.2% to 3.6%). This finding is not consistent with a study from Nova Scotia, although the overall percentage positive is similar.[4] One study from England suggests the percentage positive can be as high as 17.4%.[7] Given that Saskatoon and Regina have approximately the same number of positive cases per year, it remains unclear why Saskatoon health care practitioners ordered approximately 6,000 more tests in 2003. Although dramatically increasing the number of tests ordered remains a plausible explanation for overall enhanced detection, it can only partially explain significant differences in incidence between Saskatoon and the national average.

The timely reporting of Ct and GC and sexual contacts are integral components of disease control efforts. In Saskatoon, only 1.3% of physicians and 9.1% of STI clinic nurses notified Public Health within 72 hours of a suspected case, although 75.7% of physicians and 100% of STI clinic nurses notified Public Health within 72 hours of a confirmed case. It is possible that Saskatoon physicians and nurses believe that they are only required to inform Public Health after a confirmed lab report. A national survey of 7,300 American physicians indicates that less than half of physicians notify Public Health of Ct and GC (38.3% and 44.3%).[8] Two studies cite physician confusion over mandatory reporting requirements and procedures.[8,9]

Our study also found that physicians obtained sexual contact information from 51.2% of patients, in comparison with STI clinic nurses, who obtained this information from 85.4% of patients. Three other studies suggest that only 9-17% of physicians are willing to send sexual contact notifications, opting instead to instruct their patient to contact Public Health or their partner directly.[8,10,11]

Recurrence rates of Ct or GC within one year of initial treatment were 26% lower for patients treated by STI clinic nurses (5.7%) than for physicians (7.2%). In Saskatoon, STI clinic nurses spend 45 minutes for each clinical consultation in comparison to an unknown but most likely brief physician consultation. The lower repeat infection rate observed for the counselling and education group is consistent with previous findings (25-40%).[5] Two other reports indicate repeat infection rates of 10.2 and 10.8%, although there is no differentiation by treatment provider.[12,13]

Physicians and nurses play a critical role in preventing and treating sexually transmitted infections.[5] A number of reports indicate the need for additional education for health care providers in the management of sexually transmitted infections.[8-10,14-16] Future research needs to address optimal notification time of suspected infections to Public Health, assess effectiveness of strategies to increase reporting of sexual contact information and determine what factors impact likelihood of repeat infection.

REFERENCES

1. Public Health Agency of Canada. 2002 Canadian Sexually Transmitted Infections Surveillance Report. Available online at: http://www.phac-aspc.gc.ca/std-mts/stddata_pre06_04/index.htm (Accessed June 2005).
2. Public Health Agency of Canada. 2004 Canadian Sexually Transmitted Infections Surveillance Report. Available online at: http://www.phac-aspc.gc.ca/std-mts/stddata_pre06_04/index_tab_e.htm (Accessed June 2006).

3. Weir E. Upsurge of genital chlamydia trachomatis infection. *CMAJ*. Available online at: http://www.cmaj.ca/cgi/content/full/171/8/855 (Accessed June 2005).
4. Forward KR. The impact of switching to polymerase chain reaction for the diagnosis of Chlamydia trachomatis infections in women. *Can J Public Health* 2003;94:229-32.
5. US Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. *MMWR Recomm Rep* 2002;51:1-78.
6. Government of Saskatchewan: A Brief Orientation to The Public Health Act, 1994. Available online at: http://www.s:\Phb\Dp&hp\PProbyn\MANUALS\OrientationSummaryThePublicHealthActSeptember112002.doc (Accessed June 2005).
7. Evans J, Baraitser P, Cross J, Bacon L, Piper J. Managing genital infection in community family planning clinics: An alternative approach to holistic sexual health service provision. *Sex Transm Infect* 2004;80(2):142-44.
8. St Lawrence JS, Montano DE, Kasprzyk D, Phillips WR, Armstrong K, Leichliter JS. STD screening, testing, case reporting, and clinical and partner notification practices: A national survey of US physicians. *Am J Public Health* 2002;92(11):1784-88.
9. Seubert DE, Thompson IM, Gonik B. Partner notification of sexually transmitted disease in an obstetric and gynecologic setting. *Obstet Gynecol* 1999;94(3):399-402.
10. Rogstad KE, Henton L. General practitioners and the National Strategy on Sexual Health and HIV. *Int J STD AIDS* 2004;15(3):169-72.
11. Golden MR, Hogben M, Handsfield HH, St Lawrence JS, Potterat JJ, Holmes KK. Partner notification for HIV and STD in the United States: Low coverage for gonorrhea, chlamydial infection, and HIV. *Sex Transm Dis* 2003;30(6):490-96.
12. Rietmeijer CA, Van Bemmelen R, Judson FN, Douglas JM Jr. Incidence and repeat infection rates of Chlamydia trachomatis among male and female patients in an STD clinic: Implications for screening and rescreening. *Sex Transm Dis* 2002;29(2):65-72.
13. Veldhuijzen IK, Van Bergen JE, Gotz HM, Hoebe CJ, Morre SA, Richards JH. Reinfections, persistent infections and new infections after general population screening for Chlamydia trachomatis infection in the Netherlands. *Sex Trans Dis* 2005;32(10):599-604.
14. McCree DH, Liddon NC, Hogben M, St Lawrence JS. National survey of doctor's actions following the diagnosis of a bacterial STD. *Sex Transm Inf* 2003;79:254-56.
15. Markham WA, Bullock AD, Matthews P, Firmstone VR, Kelly S, Field SJ. Sexual health care training needs of general practitioner trainers: A regional survey. *J Fam Plann Reprod Health Care* 2005;31(3):213-18.
16. Griffiths C, Cuddigan A. Clinical management of chlamydia in general practice: A survey of reported practice. *J Fam Plann Reprod Health Care* 2002;28(3):149-52.

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RÉSUMÉ

Contexte : Les taux d'incidence de Chlamydia trachomatis (Ct) et de Neisseria gonorrhoeae (GC) dans le district de santé de Saskatoon sont environ le double de la moyenne nationale. Nous avons mené une étude descriptive pour tenter d'expliquer ce phénomène.

Méthode : L'étude avait les objectifs suivants : 1) déterminer si l'introduction d'une nouvelle méthode de dépistage, moins effractive et plus sensible, a entraîné ou non une augmentation des tests prescrits et du pourcentage de tests positifs; 2) déterminer le pourcentage des médecins et des infirmières de cliniques d'ITS ayant avisé la santé publique des cas suspects de Ct ou de GC dans un délai de 72 heures; 3) déterminer le pourcentage des médecins et des infirmières de cliniques d'ITS ayant indiqué les coordonnées des contacts sexuels des cas; et 4) comparer les taux de récurrence chez les patients traités par les médecins et par les infirmières de cliniques d'ITS.

Résultats : Le nombre de tests de dépistage de Ct et de GC prescrits a considérablement augmenté entre 1998 et 2003 (de 10 425 à 28 885), mais le pourcentage de tests positifs a diminué, passant de 7,2 % à 3,6 %. À peine 1,3 % des médecins et 9,1 % des infirmières de cliniques d'ITS ont avisé la santé publique des cas suspects dans un délai de 72 heures. Un peu plus de la moitié (51,2 %) des médecins ont indiqué les coordonnées des contacts sexuels, contre 85,4 % des infirmières de cliniques d'ITS. Les taux de récurrence de Ct ou de GC moins d'un an après le traitement initial étaient inférieurs de 26 % chez les patients traités par les infirmières de cliniques d'ITS que chez les patients traités par les médecins (5,7 % contre 7,2 %).

Conclusion : Les dispensateurs de soins du district de santé de Saskatoon auraient besoin d'une formation complémentaire sur la gestion des infections transmises sexuellement.