Risk of coinfection with *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in Nova Scotia

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**BACKGROUND:** The frequency of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* coinfection can vary depending on their individual incidence and prevalence rates.

**OBJECTIVE:** To determine the frequency of *C. trachomatis* and *N. gonorrhoeae* coinfections by evaluating the results of testing in 2007 and 2008 to better inform testing and treatment decisions.

**METHODS:** Specimens from the same patient submitted on the same day served as the basis for the present study. The age, sex and the source of the specimen were also linked to the accession number. Infection and coinfection rates were analyzed in both males and females.

**RESULTS:** Concurrent testing was performed on 41,567 female specimens and 1827 male specimens, of which, 1495 female samples (3.6%) tested positive for *C. trachomatis* infection and 88 (0.2%) tested positive for *N. gonorrhoeae* infections. Only 31 females were coinfected; however, for those between 11 and 25 years of age, 25 of 61 females (40.1%) with *N. gonorrhoeae* infection also tested positive for *C. trachomatis* infection; conversely, 25 of 1248 females (2.0%) with *C. trachomatis* infection also tested positive for *N. gonorrhoeae* infection. For males, 213 (11.7%) tested positive for *C. trachomatis* infection, and 59 (3.2%) tested positive for *N. gonorrhoeae* infection. In 30 males with *N. gonorrhoeae* between 11 and 25 years of age, and 149 males with *C. trachomatis*, eight coinfections were observed (26.7% and 5.3%, respectively). Of those older than 25 years of age, only five of 905 men and six of 19,465 women were coinfected. None of the 10,935 women who were 30 years of age or older had coinfections.

**CONCLUSION:** The *N. gonorrhoeae* coinfection rate in males with *C. trachomatis* may justify empirical antimicrobials; however, in females, the proportion of coinfected may not justify empirical treatment for *N. gonorrhoeae* infection when the *C. trachomatis* test is positive and *N. gonorrhoeae* testing has not been performed.

**Key Words:** *Chlamydia trachomatis*; Coinfection; *Neisseria gonorrhoeae*

Both *Chlamydia trachomatis* and *Neisseria gonorrhoeae* are commonly occurring sexually transmitted bacteria that produce broadly overlapping clinical syndromes. In men, infection is most often manifested as urethritis; women most often develop cervicitis. The large majority of infections in women are asymptomatic. Asymptomatic infections are less commonly seen in men, but still represent an important reservoir for transmission. Our laboratory tests approximately 25,000 Nova Scotia clients yearly for *C. trachomatis*, and about 4% of these tests are positive; of the 15,000 cultures for *N. gonorrhoeae*, about 0.2% are positive. The prevalence of both *C. trachomatis* and *N. gonorrhoeae* infections in males and females of different age groups varies considerably. Many physicians tend to only test for *C. trachomatis*; guidelines suggest empirical treatment of *N. gonorrhoeae* in those patients testing positive for the former.

Recommendations to treat patients for concurrent infections would be better informed if there was recent Canadian research relating to the frequency of coinfections in males versus females, and in younger versus older adults.

We evaluated the results of testing in our laboratory over a two-year period to precisely determine the frequency of coinfection in males and females, and at different ages, to better inform testing and treating decisions.

**METHODS**

Specimens for *C. trachomatis* and *N. gonorrhoeae* testing submitted together and registered in the laboratory information system served as the basis for the present study. The specimens were primarily obtained from the Capital District Health Authority (Halifax, Nova Scotia), and the vast majority of tests were
performed by physicians in their private offices. There is one sexually transmitted infection clinic, which runs for approximately 6 h/week and is physician based. Testing in Nova Scotia is seldom performed by nurse practitioners; no testing was performed for jurisdictions outside of Nova Scotia. These specimens were assigned the same laboratory accession number. The results of both *C. trachomatis* and *N. gonorrhoeae* testing were extracted from the database, stripped of unique identifiers, and joined using the common accession number, as well as the age and sex of the patients. Results were abstracted from the laboratory information system database.

Specimens for *N. gonorrhoeae* testing were submitted using the Copan M40 Transystem specimen transport system (Copan Diagnostics Inc, USA) and were processed on the day of receipt. Cultures were performed using modified Thayer-Martin media incubated in 10% CO₂ at 37°C for 48 h and identified using conventional means (1). Genital swabs and urine samples (the most common sample in men) were tested using the Cobas Amplicor *C. trachomatis* analyzer (Roche Diagnostics, Canada) as described in the manufacturer’s package insert. Female urine sample testing was very rarely performed. Internal controls were used for female urethral but not cervical specimens. The Cobas Amplicor analyzer automatically performed all of the amplification, hybridization and detection steps. All results were interpreted according to the manufacturer’s guidelines, based on signal cut-off readings.

A copy of the protocol was reviewed and approved by the Capital Health Research Review Board. The present study did not receive any funding.

RESULTS

In total, 41,567 specimen pairs were obtained from females and 1827 specimen pairs from males (Figure 1). Of which, 1495 female samples tested positive for *C. trachomatis*, and 88 (0.2%) tested positive for *N. gonorrhoeae*. Females between 16 and 20 years of age had *C. trachomatis* detected in 7.1% of samples and *N. gonorrhoeae* in only 0.3%. Two hundred forty-seven (1.3%) specimens received from women older than 25 years of age were positive for *C. trachomatis*, and 0.14% of cases tested positive for *N. gonorrhoeae* (Table 1). Only six women older than 25 years of age were coinfected with both *N. gonorrhoeae* and *C. trachomatis*.

Almost one-half of the testing was performed on men 26 years of age or older (Table 1). *C. trachomatis* infection was more common in males younger than 26 years of age; however, the proportion testing positive for *N. gonorrhoeae* infection was not significantly different. Patients with *N. gonorrhoeae* infection commonly tested positive for *C. trachomatis* infection. Twenty-five of the 61 (41%) women younger than 26 years of age who had *N. gonorrhoeae* infection also had *C. trachomatis* infection (Figure 2). Twenty-five of the 1248 (2.0%) females 25 years of age or younger with *C. trachomatis* also had *N. gonorrhoeae* infection. In women older than 25 years of age, six of 27 (22.2%) with *N. gonorrhoeae* infection also had *C. trachomatis* infection; six of the 247 women with *C. trachomatis* infection also had *N. gonorrhoeae* infection. There were no coinfecions in women older than 30 years of age, and only one coinfection in a man older than 30 years of age.

DISCUSSION

The testing practices of Nova Scotia physicians vary widely. The tests that we received represented a composite of patients with symptoms suggestive of a sexually transmitted infection who may have been in contact with an infected partner, who may have been tested because they fell within established guidelines or who may have been tested as part of a regular sexual health checkup (for instance, with an annual contraceptive renewal visit). As is the case in many other centres, women were tested much more frequently than men, and the lower positivity rate in women was more a reflection of prevalence; whereas, in men, more testing was performed for symptoms and for contacts. Irrespective of how patients were identified, this should not fundamentally affect our observations regarding the proportion that was coinfected.

Other studies (2-6) have observed that the frequency of coinfection can vary dramatically, depending on the setting and the background prevalence of each of these sexually

![Figure 1](image_url)  
**Figure 1** The number of specimens received for both Chlamydia trachomatis and Neisseria gonorrhoeae testing by age group

### TABLE 1

<table>
<thead>
<tr>
<th>Age</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤25 years</td>
<td>&gt;25 years</td>
</tr>
<tr>
<td>Both negative, n</td>
<td>20,818</td>
<td>19,197</td>
</tr>
<tr>
<td>CT positive/NG negative, n (%)</td>
<td>1,223 (5.53)</td>
<td>241 (1.24)</td>
</tr>
<tr>
<td>CT negative/NG positive, n (%)</td>
<td>36 (0.16)</td>
<td>21 (0.11)</td>
</tr>
<tr>
<td>Coinfected, n (%)</td>
<td>25 (0.11)</td>
<td>6 (0.03)</td>
</tr>
<tr>
<td>Total tests performed, n</td>
<td>22,102</td>
<td>19,465</td>
</tr>
</tbody>
</table>
transmitted infections. Creighton et al (2) found that 24% of heterosexual men and 38% of women with gonorrhea also had chlamydia. The opposite was less often true, ie, heterosexual men with chlamydia had gonorrhea in 18% of cases; whereas, 13% of women also had gonorrhea. Most of the coinfected were between 15 and 19 years of age. The high prevalence in this setting suggested a policy of epidemiological treatment for chlamydia in patients known to have or be in contact with gonorrhea. In a very high-prevalence setting, a sexually transmitted disease clinic in Edinburgh, Scotland, identified chlamydia in 24% of men who had sex with men and who had rectal gonorrhea (3). Nsuami et al (4) studied approximately 6000 high school students in Louisiana (USA). In this relatively high-prevalence setting, gonorrhea was detected in 11% of students with chlamydia; conversely, 42% of students with gonorrhea also had chlamydia.

Furthermore, two studies within a low-prevalence setting were reported. The first from Sydney, Australia, by Tapsall and Kinchington (5), identified only four of 124 men with chlamydial infections with concurrent N gonorrhoeae (5). van Bergen et al (6) recently described their experience in the Netherlands (6), and found a very low rate of coinfection in a community where gonorrhea had a very low prevalence. Based on their evidence, they suggested that population screening for asymptomatically infected gonorrhea may no longer be indicated in Holland. Rather than suggest empirical treatment, they suggested that patients be tested for N gonorrhoeae infection if C trachomatis tests were positive. Canadian treatment guidelines suggest ‘empirical cotreatment when a diagnosis of N gonorrhoeae is made without waiting for test results of C trachomatis due to the significant probability of coinfection (20% to 42%)’ (7). The coinfection rates that are cited in the Canadian guidelines are not, however, based on Canadian data (2,8).

Testing for N gonorrhoeae infection is infrequently performed alone, and it is unlikely that clinicians will encounter a patient with N gonorrhoeae infection without results of C trachomatis testing. On the rare occasions when this situation arises, the very high coinfection rate in both males and females should easily justify cotreatment. The opposite situation is often encountered; ie, C trachomatis testing is positive, but N gonorrhoeae testing is not performed. The 5.4% coinfection rate in males younger than 26 years of age might justify empirical treatment, especially when follow-up is not reasonably assured. Only 2.0% of females younger than 26 years of age diagnosed with C trachomatis infection were coinfected with N gonorrhoeae. Whether these patients should empirically receive an antibiotic or be tested for gonorrhea should be the subject of further analysis.

REFERENCES

6. van Bergen JE, Spaargaren J, Götz HM, et al. Population prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae in the Netherlands. Should asymptomatic persons be tested during population-based chlamydia screening also for gonorrhoeae or only if chlamydial infection is found? BMC Infect Dis 2006;6:42.