

to avoid speculation in the press or in the scientific literature about adverse health patterns of a population. The only harm suffered by the citizens of Chomedey was the result of unfounded anxiety.

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Chlamydia trachomatis infections in women with urogenital symptoms

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Chlamydia trachomatis was isolated from 30 of 100 women attending a family physician's office with dysuria, frequency or vaginal discharge, compared with 2 of 30 asymptomatic women. Multiple infections were common: *C. trachomatis* coexisted with *Gardnerella vaginalis*, *Candida albicans*, *Trichomonas vaginalis* or a bacterial cause of urinary tract infection in 15 patients. *C. trachomatis* was isolated alone from 15 symptomatic women. The source of the positive culture was not always the site of symptoms. *C. trachomatis* was isolated from both the cervix and the urine of 9 patients, either simultaneously or sequentially. The probability of finding a chlamydial infection was 30% in young women with vaginal discharge alone, 33% in those with dysuria and frequency alone and 53% in those with abdominal or pelvic pain in addition to lower urogenital tract symptoms.

Sur 100 femmes vues au cabinet d'un médecin de famille alors qu'elles souffraient de dysurie, de pollakiurie ou d'un écoulement vaginal, *Chlamydia trachomatis* fut isolé de 30. Comparativement, chez 30 femmes asymptomatiques *C. trachomatis* fut isolé de 2. Les infections multiples étaient fréquentes: *C.*

trachomatis coexistait avec *Gardnerella vaginalis*, *Candida albicans*, *Trichomonas vaginalis* ou une cause bactérienne d'infection urinaire chez 15 patientes. *C. trachomatis* fut retrouvé seul chez 15 patientes symptomatiques. La source des cultures positives n'était pas toujours le foyer des symptômes. *C. trachomatis* fut isolé du col utérin et de l'urine de neuf patientes, soit simultanément, soit en séquence. La probabilité de trouver une infection à *Chlamydia* était de 30% chez les femmes jeunes qui avaient seulement un écoulement vaginal, de 33% chez celles qui souffraient seulement de dysurie et de pollakiurie, et de 53% chez celles qui avaient des douleurs abdominales ou pelviennes en plus des symptômes touchant les voies urogénitales basses.

Chlamydia trachomatis causes a wide variety of infections.¹ In men it is a frequent cause of nongonococcal urethritis, epididymitis and prostatitis;² in women it causes the urethral syndrome, cervicitis and pelvic inflammatory disease, sometimes leading to infertility.^{3,4} It can be passed from an infected mother to her newborn infant, causing inclusion conjunctivitis and pneumonia.^{5,6} Although chlamydial infections resemble gonorrhoea in their range of sites and prolonged carrier state,^{7,8} penicillins are not effective in treating them.

Dysuria, frequency and vaginal discharge are among the commonest symptoms of women visiting their family physician. We designed a study to determine whether

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chlamydial infections occur more frequently in women with urogenital symptoms than in asymptomatic women.

Methods

Women between the ages of 16 and 45 years attending a family practice during 1979 and 1980 who were not pregnant were eligible for the study if they had not received antibiotics within the previous month. Those presenting with dysuria, frequency or vaginal discharge were enrolled in a symptomatic study group. Healthy women attending for routine Papanicolaou smears or contraceptive advice were accepted as control subjects if they had been free of urogenital symptoms for the previous 6 months. Women without symptoms who had been in sexual contact with men with gonorrhoea or nongonococcal urethritis were excluded from the study.

Speculum examination and bimanual palpation were performed on all patients, and separate swabs were taken from the cervix for culture of *C. trachomatis* and other pathogens. Urine samples were obtained from most of the patients: a midstream specimen for routine bacterial culture and an early morning specimen for chlamydial culture. Samples for culture of *C. trachomatis* were collected in a sucrose phosphate transport medium containing vancomycin, frozen at -70°C , then cultured on cycloheximide-treated McCoy cells for 3 days.⁹ Chlamydial inclusions were recognized after Giemsa staining. Swabs for culture of *Neisseria gonorrhoeae* were placed in Amies' transport medium, and those for culture of *Gardnerella vaginalis* in vaginalis medium. Yeast was identified from either of these media. A hanging drop was examined microscopically for *Trichomonas vaginalis*. Midstream urine specimens were examined quantitatively, and a count of more than 100 000 organisms/ml was taken to indicate a bacterial urinary tract infection. Routine cultures were then made to identify the organism.

Statistically significant differences between the study groups were determined by the chi-square test with Yates' correction or the *t*-test.¹⁰

Results

The symptomatic study group contained 100 women but the control group only 30 women. The mean age of the symptomatic group was 25 years and that of the control group 26 years. There was no statistically significant difference in mean age or age distribution between the two groups.

Table I—Isolation of urogenital pathogens from symptomatic and asymptomatic women

Pathogen	No. (and %) * of women tested whose samples yielded pathogens	
	Symptomatic	Asymptomatic
<i>Chlamydia trachomatis</i>	30/100 (30) †	2/30 (7) †
<i>Gardnerella vaginalis</i>	20/65 (31)	6/25 (24)
<i>Candida albicans</i>	30/100 (30)	4/30 (13)
Coliforms (> 10 ³ /ml of urine)	15/76 (20) ‡	0/25 (0) ‡
<i>Trichomonas vaginalis</i>	3/100 (3)	0/30 (0)
<i>Neisseria gonorrhoeae</i>	0/100 (0)	0/30 (0)

*Significantly different at $P < 0.02$ and †0.05.

The isolation of urogenital pathogens is shown in Table I. In the symptomatic group of 100 women *C. trachomatis* was cultured from 30 patients (30%) — from the cervix alone in 20, from the urine alone in 8 and from both in 2. In contrast, in the control group of 30 asymptomatic women *C. trachomatis* was cultured from only 2 (7%), a significantly smaller proportion ($P < 0.02$), and in each case the organism was isolated only from the cervix. Although vaginal infections caused by *G. vaginalis* and *Candida albicans* were commoner in the symptomatic than in the asymptomatic women, the differences were not statistically significant. A bacterial urinary tract infection was found in 15 of the 76 symptomatic patients tested (20%) but in none of the controls tested, a significant difference ($P < 0.05$). *T. vaginalis* was isolated from only three patients; *N. gonorrhoeae* was isolated from none.

Multiple infections were common: of the 30 symptomatic women from whom *C. trachomatis* was cultured 15 harboured one or more of the other organisms mentioned. There was no significant association between any two organisms. Chlamydial infections alone were found in 15 symptomatic women.

The results were analysed to determine whether any of the symptoms could predict chlamydial infections (Table II). Fifteen women complained only of dysuria and frequency. *C. trachomatis* was isolated from five of them (33%) — from the urine in three and from the cervix in two. One of the women with *Chlamydia* in the urine also had a urinary tract infection caused by *Escherichia coli*. Five other women had an *E. coli* infection alone. No pathogens were isolated from the cultures from the remaining five patients.

Of 56 women who presented with vaginal discharge only, *C. trachomatis* was cultured from 17 (30%) — from the cervix in 12, from the urine in 3 and from both in 2. Nine of these patients had chlamydial infections alone, and the discharge was most often described as "creamy". From the other eight women additional pathogens were isolated that could have contributed to their symptoms; these included *G. vaginalis*, *T. vaginalis* and *C. albicans*.

Urinary tract and vaginal symptoms were reported by 29 women. *C. trachomatis* was isolated from eight patients (28%) — from the cervix in six and from the urine in two. Three of the eight had chlamydial infections alone; from the other five an additional pathogen — *C. albicans*, *G. vaginalis* or *E. coli* — was isolated.

Fifteen women complained of abdominal pain in addition to lower urogenital tract symptoms. Eight of them (53%) proved to have chlamydial infections. Of these women seven had pelvic pain, and their cervical

Table II—Rates of chlamydial infection in symptomatic women

Symptoms	No. (and %) of women from whom <i>C. trachomatis</i> was cultured
Vaginal discharge (n = 56)	17 (30)
Dysuria and frequency (n = 15)	5 (33)
Vaginal discharge, dysuria and frequency (n = 29)	8 (28)
Abdominal pain and urogenital symptoms (n = 15)	8 (53)

swabs yielded *C. trachomatis*; the other woman had flank pain and *C. trachomatis* in the urine, perhaps indicating a chlamydial infection of the upper urinary tract. The remaining seven women had cultures that were negative for chlamydia.

At the time of initial testing *C. trachomatis* was isolated from both the cervix and the urine of only two patients. During follow-up, however, this organism was cultured from both sites, either simultaneously or sequentially, in seven other women, only one of whom had both urinary and genital tract symptoms.

Discussion

The finding that 30% of women with urogenital symptoms attending a family physician's office had chlamydial infections was unexpected. This group of women differed from the patients attending sexually transmitted disease clinics in that most admitted to only one sexual partner in the previous year and none had gonorrhea. Rates of *C. trachomatis* infection for women attending sexually transmitted disease clinics range from 19% to 37%^{11,12} and for those attending gynecologic outpatient clinics from 5% to 19%.^{13,14} In most of those surveys the rates were calculated from consecutive attenders at the clinics, both symptomatic and asymptomatic, and samples were taken from the cervix only. The rate of 7% for chlamydial infections in our asymptomatic control group compares with the rates of 4.6% to 7% reported for student health service patients.^{8,15}

That *C. trachomatis* can cause urogenital symptoms in women is supported by our findings. Of the 30 symptomatic women with chlamydial infections *C. trachomatis* was the only pathogen cultured from 15; from the other 15 at least one additional pathogen was isolated that could have contributed to or accounted for the symptoms. The finding of five chlamydial infections in the 15 women with dysuria and frequency supports previous evidence that *C. trachomatis* is an important cause of the urethral syndrome, or cystourethritis, in women.^{2,3} In nine patients who complained of vaginal discharge *C. trachomatis* was the sole pathogen isolated. Of the 14 women who presented with pelvic pain 7 had chlamydial infections. An association between *C. trachomatis* and mild pelvic inflammatory disease in North America has been reported.¹⁶

It is evident that *C. trachomatis* infection does not always cause symptoms and that the source of the positive culture is not always the site of symptoms. This is illustrated by the two asymptomatic patients with chlamydial infections, by the two patients with urinary tract symptoms alone in whom *Chlamydia* was isolated from the cervix and by the three patients with vaginal discharge alone who had *C. trachomatis* in the urine.

N. gonorrhoeae can infect the urinary and genital tracts simultaneously, and there is a report of *C. trachomatis* doing the same.¹⁷ In our study *Chlamydia* was cultured from both the cervix and the urine of nine patients at the same time or on separate occasions during follow-up.

The cervix probably acts as a reservoir from which the pelvic organs and the urinary tract can become infected at any time. Because of the risk of infertility from chlamydial pelvic inflammatory disease it is imper-

ative that women with *C. trachomatis* infections be treated. Their partners should be treated at the same time to prevent reinfection.¹⁸ Tetracycline, erythromycin and cotrimoxazole will all eradicate *Chlamydia*.¹⁹ The Centers for Disease Control in Atlanta, Georgia now recommend tetracycline for treating *N. gonorrhoeae* infections because *C. trachomatis* is so common in patients with gonorrhea.¹⁵

This study confirms previous reports that *C. trachomatis* is numerically more important than gonorrhea infection in the community.¹⁵ It is as common as yeast or *G. vaginalis* infection and commoner than bacterial urinary tract infection or trichomoniasis. How often *C. trachomatis* is responsible for the urethral syndrome or vaginal discharge is difficult to judge because it often coexists with other urinary and genital pathogens. The results of our study show that if a young woman presents with vaginal discharge alone the probability of her having a chlamydial infection is 30%, if she presents with dysuria and frequency alone the probability is 33%, but if she complains of abdominal or pelvic pain in addition to lower urogenital tract symptoms the probability exceeds 50%. In fact, *Chlamydia* may cause pelvic inflammatory disease more often than this. A recent study of laparoscopically verified cases found *C. trachomatis* to be a causative factor in 85%.²⁰ It is hoped that laboratory facilities for diagnosing *C. trachomatis* infection will soon be within reach of all physicians.

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