Chlamydial infection among females attending an abortion clinic: prevalence and risk factors

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To determine the prevalence of *Chlamydia trachomatis* infection and the epidemiologic risk factors for chlamydial infection in the Quebec City region, screening was done with an enzyme immunoassay in 920 females who attended an abortion clinic between November 1985 and June 1986. The organism was detected in 105 (11.4%) of the patients. After adjustment for confounding variables, four variables were found to be independent risk factors for chlamydial infection: age 24 years or less (prevalence ratio 3.0 [p < 0.001]), two or more sexual partners during the previous year (prevalence ratio 1.8 [p = 0.001]), no contraception or the use of a nonbarrier method (prevalence ratio 1.9 [p = 0.030]) and living in an urban area (prevalence ratio 1.6 [p = 0.046]). The results confirm that chlamydial infection is prevalent in this population. The identified risk factors may prove useful in determining the target population for screening programs.

La prévalence de l'infection à *Chlamydia trachomatis* et les facteurs de risque associés dans la région de Québec ont été étudiés dans 920 femmes consultant pour avortement entre novembre 1985 et juin 1986. Une infection cervicale détectée par l'analyse enzymatique est retrouvée chez 105 (11,4%) des patientes. Quatre caractéristiques socio-démographiques ont été identifiées, après ajustement, comme facteurs de risque indépendants: l'âge à 24 ans ou moins (l'indice de prévalence 3,0 [p < 0,001]), deux partenaires sexuels ou plus pendant la dernière année (l'indice de prévalence 1,8 [p = 0,001]), l'absence de contraception ou l'utilisation d'une méthode contraceptive autre que de type barrière (l'indice de prévalence 1,9 [p = 0,030]) et le fait de résider en milieu urbain (l'indice de prévalence 1,6 [p = 0,046]). Ces résultats confirment que l'infection à *Chlamydia* est fréquente dans cette population. Les facteurs de risque identifiés pourraient être utilisés pour développer un dépistage sélectif.

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Infection with *Chlamydia trachomatis* is now recognized as one of the most prevalent sexually transmitted diseases (STDs).[1,2] It is probably the principal cause of salpingitis in Western societies[3] and consequently is one of the leading causes of infertility and ectopic pregnancy.[4,5] Perinatal transmission of *C. trachomatis* is also frequent and can lead to conjunctivitis and pneumonia in the newborn.[6,7]

Mucopurulent cervicitis and vaginal discharge are frequent findings in infected women.[8,9] However, a high prevalence of *C. trachomatis* infection in asymptomatic women has been reported.[10,11] Although there is still more to be learned about the natural history of asymptomatic chlamydial infection,[12] it is now clear that it can evolve toward pelvic infection[11,13] or give rise to neonatal infection.[7]

In response to this alarming situation, systematic screening in patients at high risk, particularly

young, sexually active women, has been advocated.[14,15] However, given limited resources, it is important to identify risk factors in order to screen selectively. Apart from being symptomatic and young, important risk factors reported are number of sexual partners and method of contraception.[16,17] Combined use of several of these factors can result in more selective screening.[17]

Since we had no real idea of the extent of the problem in our region, we were not ready to promote such screening. We chose to start by studying a population that we believed to be at high risk for chlamydial infection. Because it was too expensive to do cultures for hundreds of patients and because the enzyme immunoassay method has been reported to have good sensitivity and specificity,[18,19] we decided to perform screening with this method. We report on the first 7 months of systematic screening in our abortion clinic.

Methods

The study population consisted of women and girls living in one public health district who attended the Family Planning Clinic at the Centre hospitalier de l'université Laval, Ste-Foy, PQ, for curettage abortion between November 1985 and June 1986. Fourteen patients who were taking antibiotics and three who did not undergo chlamydial screening were excluded from the study. The medical history was obtained by a nurse, and each patient was examined by a physician before the abortion. At the speculum examination two endocervical swabs were taken after the cervical mucus had been cleared. One swab was streaked onto a Thayer–Martin agar plate and placed in a sealed bag containing carbon-dioxide-generating tablets. The other swab was placed in a tube containing storage reagent (STD-EZE, Abbott Laboratories Limited, Montreal). Specimens were sent hourly to the microbiology laboratory for culture of *Neisseria gonorrhoeae* by means of standard methods and for detection of *C. trachomatis* with the Chlamydiazyme test (Abbott Laboratories).

The following data were abstracted by a trained nurse from the medical record: age, education, occupation, place of residence, parity, number of sexual partners during the previous year, contraceptive method used, history of pelvic inflammatory disease (PID), history of STD, and results of chlamydial and gonococcal screening. The information was then recorded on precoded forms.

The Statistical Analyses System (SAS Institute Inc., Cary, North Carolina) was used to analyse the data. The importance of risk factors was evaluated by means of prevalence ratios. Adjustment for confounding variables was done by means of the Mantel–Haenszel method.[20] Chi-square analysis was used to test single fourfold tables, and the Mantel–Haenszel chi-square test was used for pooled results.

Results

A total of 920 females with a mean age of 24.4 (extremes 13 and 44 years) underwent screening during the study period. The sociodemographic characteristics of the patients are shown in Table I. All the patients were asymptomatic at the time of their examination.

C. trachomatis was detected in 105 of the patients (11.4%) and *Neisseria gonorrhoeae* in 8 (0.9%), 4 of whom also harboured *C. trachomatis*.

The proportion of patients, by age and by number of sexual partners in the previous year, in whom *C. trachomatis* was detected is shown in Figs. 1 and 2 respectively. The organism was detected in 83 of the 518 patients (16.0%) under 25 years of age and in 22 of the 402 patients (5.5%) aged 25 or more, a significant difference ($p < 0.001$). It was detected in 56 of the 628 patients (8.9%) with one sexual partner during the previous year and in 49 of the 292 patients (16.8%) with two or more partners, also a significant difference ($p < 0.001$). The interaction between these two variables is shown in Fig. 3. *C. trachomatis* was detected in 41 of the 172 patients (23.8%) under 25

Table I — Sociodemographic characteristics of 920 patients who attended an abortion clinic between November 1985 and June 1986 and underwent screening for *Chlamydia trachomatis*

Characteristic	No. (and %) of women
Age, yr	
< 20	219 (24)
20–24	299 (32)
25–29	210 (23)
≥ 30	192 (21)
No. of years of schooling	
≤ 7	14 (2)
8–12	487 (53)
13–15	268 (29)
≥ 16	151 (16)
Occupation	
Worker	461 (50)
Student	285 (31)
Other	174 (19)
Parity	
0	619 (67)
≥ 1	301 (33)
No. of sexual partners in previous year	
1	628 (68)
2	162 (18)
≥ 3	130 (14)
Contraceptive method used	
Natural*	438 (48)
Barrier†	157 (17)
Other‡	101 (11)
None	224 (24)

*Includes temperature and rhythm methods, withdrawal and related methods.
†Includes condom, cervical cap, diaphragm, sponge and spermicide.
‡Includes oral contraceptive pill, intrauterine device and surgical sterilization.

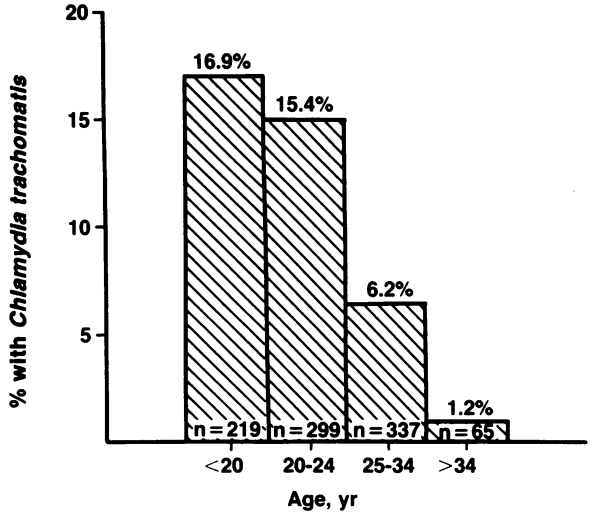

Fig. 1 — Proportion of patients undergoing curettage abortion who had *Chlamydia trachomatis* in endocervical mucus, by age.

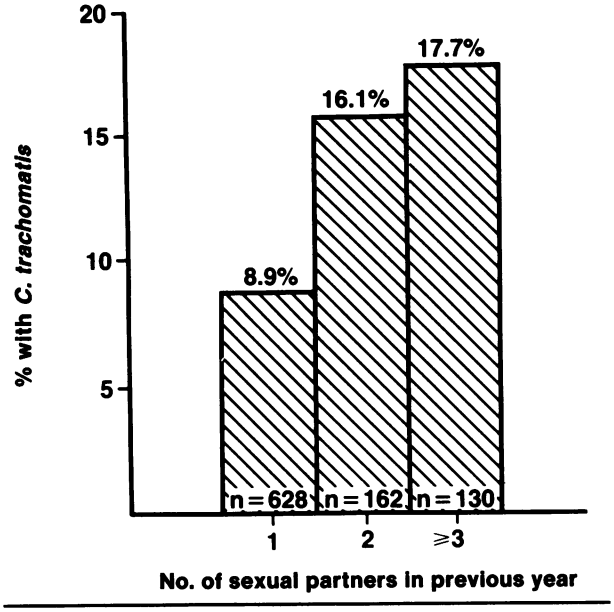

Fig. 2 — Proportion of patients with *C. trachomatis*, by number of sexual partners during previous year.

years of age who had two or more sexual partners during the preceding year.

C. trachomatis was detected in 11 of the 157 patients (7.0%) using a barrier method of contraception, compared with 94 of the 763 patients (12.3%) using a nonbarrier method or no contraception ($p = 0.057$).

Among the 93 patients with a history of gonococcal disease or PID *C. trachomatis* was detected in 16 (17.2%), compared with 89 of the 827 (10.8%) without such a history ($p = 0.064$).

Of the 693 patients living in urban areas 88 (12.7%) had a positive result of screening for *C. trachomatis*, compared with 17 of the 227 (7.5%) living in rural areas ($p = 0.032$). There was no significant relation between a positive result and occupation or education once age was adjusted for.

Estimates of the effect of each risk factor after adjustment for the main confounding variables are presented in Table II.

Discussion

Our findings must be interpreted with caution.

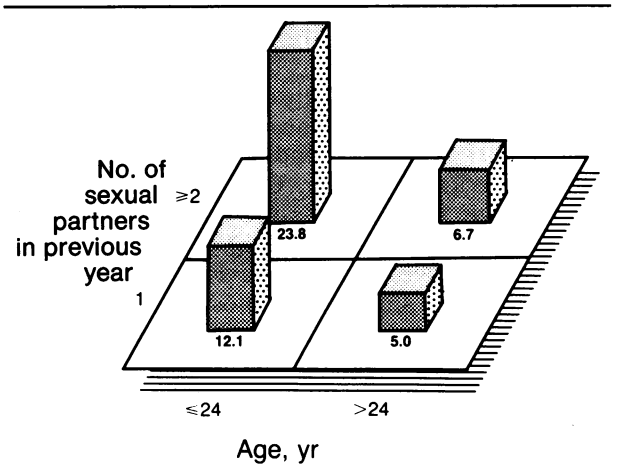

Fig. 3 — Proportion of patients with *C. trachomatis*, by age and by number of sexual partners during previous year.

Table II — Independent risk factors for positive result of screening

Risk factor	Adjusted prevalence ratio (and 95% confidence limits)	p
Age ≤ 24 yr	3.0 (2.0, 4.6)*	< 0.001
Two or more sexual partners in previous year	1.8 (1.3, 2.5)†	0.001
No contraception or use of nonbarrier method	1.9 (1.1, 3.3)‡	0.030
Living in urban area	1.6 (1.0, 2.7)§	0.046
History of gonorrhea or pelvic inflammatory disease (PID)	1.4 (0.8, 2.3)‖	NS¶

*Adjusted for contraceptive method.
†Adjusted for age and contraceptive method.
‡Adjusted for age.
§Adjusted for number of sexual partners in previous year and history of gonorrhea or PID.
‖Adjusted for number of sexual partners in previous year and place of residence.
¶NS = not significant ($p > 0.05$).

A positive result of the Chlamydiazyme test is not synonymous with chlamydial infection. The specificity of this test has been estimated to be approximately 98%.[18,19] The positive predictive value for a population prevalence rate of cervical chlamydial infection of 10% has been estimated to be 80%.[19] Since the sensitivity of the test is about equal to the sensitivity of one culture,[19] our prevalence rates are greater than those obtained by culture. However, because culture gives an underestimate of the prevalence our results are probably closer to the true prevalence in the study population. To interpret prevalence ratios one must bear in mind the effect of the small, nondifferential misclassification of diseased people, which leads to underestimation of the values.[21]

Our prevalence rates are comparable to those reported by Amortegui and colleagues,[22] who detected cervical *C. trachomatis* in 9% of 210 women seeking abortion in Pittsburgh, and by Embil and Pereira,[10] who reported a rate of 9% among 491 asymptomatic women attending family planning and prenatal clinics in Halifax. They are also similar to those of Handsfield and associates,[17] who reported a rate of 9.3% among 1059 primarily asymptomatic women attending family planning clinics in Seattle. The prevalence rate in our population was slightly higher than that reported by Bowie and coworkers[23] (7% of 123 women attending a student health clinic at the University of British Columbia, Vancouver) and by Jaczek[24] (7% of 793 women attending a family planning clinic in Windsor, Ont.). Our results are in the same range as those reported for Scandinavian abortion clinics (5.1% to 15.9%).[25-31]

The prevalence rate of cervical *C. trachomatis* infection in our study was almost 13 times that of cervical gonorrhea. This agrees with previous findings from family planning clinics.[17,22-24,26,28,31] A lower ratio is more common among women attending STD clinics.[23,32,33]

The association between being young and having chlamydial infection has been reported by many authors.[9,17,22,28,29,31,34-37] In our study the association was not explained by the number of sexual partners in the previous year or by the contraceptive method since it persisted after adjustment for these potentially confounding variables. It is thought that adolescents are more susceptible because of lower levels of protective antibodies, a wider area of cervical columnar epithelium and, probably, reduced access to general medical care.[38] Other behavioural characteristics of adolescents may also be partly responsible for this association.[39]

Our finding of a positive relation between multiple sexual partners and chlamydial infection is in agreement with the findings in other reports.[16,17,40] An association with multiple sexual partners is common in STD.[41] Some workers have reported a stronger association with age at the time of first intercourse and duration of regular sexual activity in adolescent girls.[36] Handsfield and associates[17] described the important effect of a new sexual partner in the preceding 2 months. Our finding of an association with no contraception or use of a nonbarrier method (mainly natural methods in our study) has been reported by other investigators.[9,16,17] It could be explained by a protective effect of condoms,[42] but behavioural characteristics of users of barrier methods could also be partly responsible. We could not study the association with oral contraceptives described by many authors[43] because of the contraceptive practice patterns of our population.

After taking confounding variables into account, we found an association between living in an urban area and chlamydial infection. A similar association has been reported in the United States for notified incident cases.[41] It may be explained by a true low prevalence in rural areas or by differences in population characteristics not considered in our study.

The absence of a significant association with a history of STD has also been reported by other workers.[4,16,17] Harrison and collaborators[9] found an association with a history of gonorrhea, but number of sexual partners was not adjusted for.

There is some question as to the external validity of our study. Women seeking abortion have special characteristics. Their sexual relationships are usually less stable than those of other women, and they rarely use effective contraceptive methods. In spite of these limitations, we think that our study population can be used as a "sentinel" population for surveillance of STD. It shows us that there is a sizeable reservoir of asymptomatic *C. trachomatis* carriers in our region. It is difficult to ascertain from our results the exact importance of each risk factor in the general population. But we found risk factors that were similar to those found in several studies done in various populations. These risk factors also have biologic plausibility. This leads us to believe that our results could be of use for other clinical settings.

Our report is one of the first to describe STD in a population of females seeking abortion in Canada. The results confirm that *C. trachomatis* infection is by far the most prevalent STD in this type of population. This gives cause for concern. The problem is as common here as in the United States or in Scandinavian countries. Young, sexually active women, particularly those who have a history of multiple sexual partners or who use no contraception or a nonbarrier method, may be considered a potential target population for screening programs. More studies are needed to evaluate the extent of the problem in other populations and to clarify the exact role of the identified risk factors.

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