Chlamydial Cervical Infection in Jailed Women

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ABSTRACT

Objectives. The prevalence of *Chlamydia trachomatis* cervical infection in incarcerated adult women has not been reported. To develop a policy for testing and treatment, we determined the prevalence of and risk factors for chlamydial infection in women in a New York City jail.

Methods. Interviews and cervical cultures for *C trachomatis* were obtained from 101 consenting female inmates.

Results. Positive cultures for *C trachomatis* were found in 27% of the participants. Mucopurulent cervical discharge and education of 8 years or less were two independent risk factors for infection, but only 63% of the infected women had one or both of these factors. If pelvic tenderness were considered as a third factor, an additional 7% of the infected women would have been identified.

Conclusions. The prevalence of chlamydial infection in this population was as high as that in populations for which presumptive treatment is recommended. Although the optimal policy for detection and treatment of chlamydial infection may vary depending on practical considerations, we suggest that women entering correctional facilities should be screened or offered presumptive therapy for *C trachomatis* infection. (*Am J Public Health.* 1993;83:551–555)

Introduction

Prisoners and detainees have a constitutional right to health care that is extended to no other population in the United States.[1] Most inmates come from disadvantaged backgrounds; therefore, the health services provided in some prisons or jails may be among the most extensive they ever receive. Because sexually transmitted diseases are common in incarcerated populations,[2–9] routine screening of incarcerated women should be considered. There are several reasons for screening incarcerated women for sexually transmitted diseases: (1) Early testing and treatment may prevent complications, such as acute salpingitis, that may develop later in the course of incarceration. (2) Treatment is effective and well tolerated. (3) Such screening and treatment may reduce the potential for the spread of sexually transmitted diseases in the outside community when the inmate is released. (4) Incarcerated individuals are not free to seek medical services available in the outside world, placing additional responsibility on prison or jail authorities to provide these services.

Chlamydia trachomatis is one of the most common sexually transmitted diseases in the United States and is often asymptomatic. Among women, its morbid consequences include salpingitis, infertility, ectopic pregnancy, and chronic pelvic pain.[10] The prevalence of chlamydial infection of the cervix has been estimated to be as high as 4% to 8% in hospital outpatient departments,[11,12] 6% to 23% in family planning clinics, and 20% to 30% in sexually transmitted disease clinics.[10] The risk of chlamydial infection in women has been linked to lower socioeconomic status and multiple sexual partners.[12,13] These conditions are frequent among women incarcerated at Rikers Island Correctional Institution in New York City: 57% are there for drug-related charges and 80% have cocaine in their urine at the time of their arrest, and women who use drugs commonly engage in prostitution to pay or barter for drugs (S. M. Safyer, unpublished data). Despite a reported prevalence of *C trachomatis* cervical infection of 20% among juvenile female detainees,[3] correctional facilities such as Rikers Island do not routinely screen for chlamydial infection. Gonorrhea and syphilis are routinely screened for on Rikers Island.

To help the Montefiore-Rikers Island Health Service establish a policy for *C trachomatis* screening and treatment of female inmates, we determined the prevalence of *C trachomatis* infection of the cervix in comparison with gonorrhea and

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TABLE 1—Characteristics of Participants and Those Who Refused to Participate		
	Participants (n = 101)	Those Who Refused to Participate (n = 22)
Age, y, mean ± SD	25.1 ± 5.9	27.5 ± 6.4
Education, y, mean ± SD	11.1 ± 1.6	11.1 ± 1.5
Race, %		
Black	56	64
Latina	30	27
White	14	9
Never married, %	72	86
Condom use, %*	29	5

*P ≤ .05.

syphilis among women detained at Rikers Island. We evaluated different strategies to determine the best screening and treatment policy for *C trachomatis* cervical infection in jailed women.

Methods

Study Population

The study was conducted in 1988 at the Correctional Institution for Women at Rikers Island, the only detention facility for females in New York City at the time of the study. The study design and questionnaire were approved by the Committee on Human Subjects at Montefiore Medical Center and by the New York City Department of Health.

Study subjects were consecutive female inmates who, at their intake physical examination, gave witnessed verbal informed consent. Of 148 women approached, 25 were excluded and 22 refused. Potential subjects were excluded for the following reasons: antibiotic use in the previous 14 days (n = 15), previous hysterectomy (n = 4), inability to speak English (n = 3), inability to give informed consent (n = 1), a mishandled specimen (n = 1), and an incomplete pelvic examination due to a painful chancroid ulcer (n = 1). Two women with other exclusion criteria were also 50 years or older. Women who refused to participate were less likely to report the use of condoms but were otherwise similar to participants (Table 1). One hundred one subjects were enrolled during 2 weeks in January and 2 weeks in April.

Eligible inmates were given a questionnaire focusing on genitourinary symptoms and sexual history. Demographic and medical data were abstracted from the medical chart. The physical and pelvic examination included an endocervical sam-

ple for *C trachomatis* culture. Gonorrhea cultures, Papanicolaou smears, syphilis serologies, and urine pregnancy tests were also obtained as part of the routine studies collected on all incoming female inmates to Rikers Island.

Laboratory Methods

Endocervical chlamydial cultures were collected on swabs and placed immediately in 2-sucrose-phosphate transport media. The samples were stored at 4°C for no more than 10 hours, after which they were stored at −70°C until the end of the 2-week collection period. The samples were then transported on dry ice to the Beth Israel Hospital Microbiology Laboratory, where *C trachomatis* cultures were performed.[12] Endocervical gonorrhea cultures and syphilis serologies and confirmatory tests were performed with standard techniques in a uniform manner for all subjects.

Statistical Methods

A univariate analysis was performed on those observed clinical variables hypothesized on the basis of previous investigations or clinical judgment to be associated with infection. Student's *t* test was used to compare the means of continuous variables. Two-sided chi-square tests were used to compare categorical variables; Fisher's Exact Test was used if a cell contained less than 10 subjects. Two continuous variables were categorized on the basis of clinical criteria. Age was divided into two categories: 24 years or younger and 25 years or older. Education was also divided into two categories: 8 years or less and 9 or more years, that is, those who did not enter high school and those who did.

For the multivariate analysis, the continuous variables were converted to

categorical variables, as described above, to simplify their use in a predictive model. Stepwise logistic regression was performed with SAS data analysis software.[14] Variables entered into the multivariate analysis included those found to be significant in univariate comparisons at *P* < .05 and variables known to be associated with risk for sexually transmitted diseases.

Results

History, Symptoms, and Examination Findings

A history of sexually transmitted diseases was frequent: 19% of the participants reported previous gonorrhea, 10% previous syphilis, and 15% previous pelvic inflammatory disease. No data on human immunodeficiency virus and acquired immunodeficiency syndrome status were available. Forty-five percent of the participants described themselves as unable to become pregnant after 1 year of regular sexual intercourse without contraception. Fifty percent of the women claimed no or one sexual partner in the previous year, 27% claimed two to four partners, and 23% claimed five or more partners. When interviewed, 22% of the women complained of pelvic pain, 29% of vaginal discharge, and 4% of dysuria. On examination, 23% had either uterine or adnexal tenderness, and 28% had mucopurulent cervical discharge as defined by Brunham et al.[15]

Laboratory Results

Of 101 cultures performed, 27 were positive for *C trachomatis* (prevalence rate 27%, 95% CI = 18%, 36%). Of the 27 women with positive chlamydial cultures, 7 (26%) reported pelvic pain, 4 (15%) had positive syphilis serologies and confirmatory tests, and 2 of these 4 (7%) had positive gonorrhea cultures.

Eight percent of the participants had positive cultures for *Neisseria gonorrhoeae* and 16% had positive syphilis serologies and confirmatory tests. Urine pregnancy tests were positive for 3% of the women. Papanicolaou test results on these 101 women are included in a previous report.[2]

Univariate and Multivariate Risk Factors for Chlamydial Infection

Women with chlamydial infection of the cervix were younger than women with negative cultures (mean age, 24.2 y vs 26.8 y; *P* < .05). Three univariate factors were associated with chlamydial infection

(P < .05): education ≤ 8 years, mucopurulent cervical discharge, and the presence of genital papillomas (Table 2). In the multivariate analysis, only two factors remained predictors of infection (P < .05): mucopurulent cervical discharge and education ≤ 8 years (Table 3).

Strategies for Selective Testing

We analyzed several different strategies for selecting women as higher risk (Table 4). For each strategy we calculated the sensitivity, specificity, percentage of the total population selected as higher risk, positive predictive value (prevalence of infection among women identified by the strategy), one minus the negative predictive value (prevalence of infection among women not selected by the strategy), and number of infected women missed. Strategy A uses the presence of either of the two independent risk factors found in this study (mucopurulent cervical discharge and lower education) to select women for screening. Strategies B through E consider the addition of clinical criteria for the empiric treatment of chlamydial infection recommended by the Centers for Disease Control.[10] These criteria include known gonorrhea, mucopurulent cervical discharge, and pelvic tenderness on examination. Strategy B uses only those factors known at the time of initial evaluation. Strategy C considers the effect of adding the gonorrhea culture result to Strategy B. Strategies D and E consider the addition of education ≤ 8 years.

Strategy D (education ≤ 8 years, mucopurulent cervical discharge, or pelvic tenderness) appears to be the best strategy for detecting women with chlamydial infection of the cervix in this study population. This strategy has the advantage of using only factors known at the time of intake, and it had the highest sensitivity and therefore missed the fewest infected women. However, if Strategy D were used, 15% of those not selected for testing or treatment would still be infected and untreated.

Discussion

In this study of 101 women incarcerated at Rikers Island, where screening for gonorrhea and syphilis is routine, the prevalence of these infections was 8% and 16%, respectively. A higher percentage of inmates (27%) had positive cultures for *C trachomatis,* an infection for which routine screening had not been performed. Symptoms were not useful in differentiating infected women. In this study, risk fac-

TABLE 2—Univariate Analysis: Factors Associated with Chlamydial Infection

Factor[a]	% Risk of Infection		Odds Ratio (95% CI)
	Factor Absent	Factor Present	
Education ≤ 8 y (6)	23.1	66.7	2.8 (1.1, 36.4)
Mucopurulent cervical discharge (28)	19.2	42.9	2.4 (1.3, 4.5)
Genital papilloma on exam (14)	21.8	50.0	2.2 (1.1, 4.2)

Note. P ≤ .05
[a]Numbers in parentheses indicate the number of women for whom the factor was present.

TABLE 3—Factors Associated Independently with Chlamydial Infection

Factor	Beta Coefficient	Odds Ratio (95% CI)
Constant	−1.7	...
Mucopurulent cervical discharge	1.6	4.9 (1.8, 13.4)
Education ≤ 8 y	2.4	11.4 (1.8, 70.7)

Note. P ≤ .05.

tors for chlamydial infection were similar to those reported by other investigators.[10,12,13] However, independent indicators of infection (mucopurulent cervical discharge and/or a lack of secondary education) identified only 63% of the infected women. If the presence of pelvic tenderness were considered as a third factor, 70% of infected women would have been identified.

Although the number of study participants infected with *C trachomatis* is high, the overall prevalence among female inmates may be higher. Women who do not use barrier methods of contraception are at higher risk for acquisition of *C trachomatis,*[12] and women who refused to participate in this study reported significantly less condom use than did participants. Further, although the culture is considered the "gold standard" for diagnosis, the sensitivity of the culture method is approximately 80%.[12,16,17]

It seems likely that other inmate populations are also at high risk for *C trachomatis* infection. As noted previously, a 20% prevalence of *C trachomatis* cervical infection in juvenile female detainees has been reported.[3] Therefore, there are several policy options that clinicians working at Montefiore-Rikers Island Health Service and medical services at similar institutions might consider. These include routine screening at intake exams for *C trachomatis* infection; empiric therapy for all inmates at the tie of admission to the institution; and empiric therapy for in-

mates identified as higher risk, with screening made available to the remaining inmates.

The Centers for Disease Control already recommend routine screening for *C trachomatis* in women at high risk of infection (demographics and local infection rates define high risk in particular populations).[10] Further, data have shown that routine screening with a rapid, direct fluorescent antigen test reduces overall costs if the prevalence exceeds 7%.[18] There are several issues, however, that make routine screening difficult. In the correctional facility setting, the use of chlamydia cultures may be impractical because the necessary laboratory expertise may not be readily available. In addition, culture results are not available for 48 hours. In contrast, rapid fluorescent and enzyme immunoassay direct antigen test results would be available on the day of detainment. However, these tests may be too expensive, and their sensitivity and specificity may vary considerably.[10]

Empiric therapy for *C trachomatis* infection is also recommended by the Centers for Disease Control on the basis of certain clinical criteria as well as for patients with gonorrhea.[10,19] Further, it has been reported that presumptive treatment of chlamydial infection is the most cost-effective strategy when the prevalence exceeds 1.5%.[20] The prevalence of infection in this study population was at least 27%; therefore, empiric treatment of all incom-

TABLE 4—Strategies for Selective Testing for Chlamydial Infection

Strategy	Risk factors	Sensitivity, %	Specificity, %	% Identified as Higher Risk	Positive Predictive Value, % [a]	1 − Negative Predictive Value, % [b]	Cases Missed[c]
A	MCD, ED	63	77	34	50	15	15
B	MCD, PT	59	62	44	36	19	11
C	MCD, PT, GC	59	61	45	36	20	11
D	MCD, PT, ED	70	61	48	40	15	8
E	MCD, PT, ED, GC	70	59	49	39	15	8

Note. MCD = mucopurulent cervical discharge; ED = education ≤ 8 years; PT = pelvic tenderness; GC = gonorrhea.
[a]Prevalence of infection among women with any of the listed risk factors.
[b]prevalence of infection among women without any of the listed risk factors.
[c]Number of cases missed if strategy is used. (total number of cases equals 27)

ing women inmates might be a logical extension of current public health practices.

Two logistical factors complicate the administration of medicine to women in prison or jail. First, approximately 8% of the female inmates on Rikers Island are pregnant (S. M. Safyer, unpublished data). The antibiotics of choice for treatment of *C trachomatis* infection, tetracycline and doxycycline, are contraindicated for pregnant women. Because amenorrhea secondary to illicit drug use is common in this population, menstrual history is an unreliable indicator of pregnancy. At the time of the study, it was routine for all new inmates to have pregnancy testing done by the Montefiore-Rikers Island Health Service, but results were not available for 48 hours. At present, a rapid, accurate pregnancy test is used at the intake exam and results are available prior to treatment. Alternatively, a second-line antibiotic such as erythromycin, recommended by the Centers for Disease Control for use in pregnant women, could be used.[10] This treatment is also effective and well tolerated.[21]

Second, dispensing medications on a daily basis for all inmates may be difficult. In the past, Rikers Island inmates who needed medications were released from their cell blocks to stand in line at the pharmacy for each dose, no matter how many times per day the drug was needed. Allowing inmates to carry a supply of their medications, as is now done by the Montefiore-Rikers Island Health Service, would make it practical to give therapy to all inmates. However, compliance might be a problem.

One option would be to empirically treat only women identified as higher risk on the basis of the two independent variables identified in this study (presence of mucopurulent discharge or education ≤ 8 years) or pelvic tenderness. This strategy would also require either pregnancy testing for all higher risk women prior to treat-

ment with doxycycline or the use of erythromycin. Female inmates at lower risk would then be screened for disease. If these factors had been used in our study population, at least 48% of the population would have received empiric treatment, of whom 40% would have been infected. However, one must consider whether it is worthwhile to differentiate risk groups and treat them differently when such a strategy may result in a population of presumptively treated women with a prevalence of infection of 40% rather than 27%.

In summary, we found that the prevalence of chlamydial infection was as high in female inmates as in other groups of women (those with *Neisseria gonorrhoeae* are coinfected with *C trachomatis* 25 to 50% of the time) for whom presumptive treatment is recommended.[10] Also, historical and clinical data were not sufficiently sensitive to identify more than 70% of infected women in our sample. We recognize that the optimal institutional policy for detection and treatment of chlamydial infection for female inmates may vary depending on the availability of testing facilities, financial considerations, the logistics of dispensing medications, the preferences of inmates and their health care staffs, and whether the prevalence in other populations is as high as that reported in this study. Certainly, our findings should be confirmed and validated in other populations of female inmates. However, our results lead us to suggest that admission to a correctional institution may serve as yet another marker of a high likelihood of chlamydial infection. We suggest that all women entering such facilities be screened or offered presumptive therapy for chlamydial infection. □

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