epidemic. JADA 1989; 119:165–215.
9. Gerbert B, Maguire BT, Hulley SB, Coates TJ: Physicians and AIDS: What patients think about HIV in medical practice. JAMA 1989; 262:1969–1972
10. Lewis CE, Freeman HE: The sexual history and counseling practices of primary care physicians. West J Med 1987; 147:165–167.
11. Mathews WC, Linn LS: AIDS prevention in primary care clinics: Testing the market. J Gen Intern Med 1989; 4:34–38.
12. Ende J, Rockwell S, Glasgow M: The sexual history in general medical practice. Arch Intern Med 1984; 144:558–561.

Screening for Chlamydial Cervicitis in a Sexually Active University Population

C. Kevin Malotte, DrPH, Edward Wiesmeier, MD, and Kristin J. Gelineau, RN, NP, MN

Abstract: Enzyme-linked immunoabsorbent assays to detect chlamydial cervicitis were performed on samples from 1,320 sexually active university women. Seventy-five (prevalence 5.7 percent) had positive tests. Demographic, history, symptom, and physical examination variables were insufficient to predict infection accurately. We conclude that screening during routine visits with this population is cost-effective. (*Am J Public Health* 1990; 80:469–471.)

Introduction

Chlamydia trachomatis is the most prevalent sexually transmitted disease in the United States.[1] Until recently, diagnosis of chlamydial infection was handicapped by the lack of an inexpensive diagnostic test. *Chlamydia* is easily treated with antibiotics, but left untreated can persist for an indefinite time, and result in severe sequelae. While symptomatic women have a higher prevalence rate, most women with cervical infections have few or no symptoms.[2]

Methods

Routine screening for chlamydial infection of all sexually active students receiving physical examinations at the University of California-Los Angeles, Student Health Service Women's Clinic was implemented in June 1986. Some women were seen for initial or yearly examinations (routine visit group) and some women were seen for symptoms, partner symptoms, or previous problem follow-up (symptom/problem group).

Specimens were tested using Chlamydiazyme™ kits run according to the manufacturer's directions. Women with positive tests were typically tested with doxycycline 100 milligrams twice daily for seven days. Sexual abstinence was encouraged during treatment; partners were referred for treatment. Test of cure using culture was requested approximately three weeks after treatment.

A total of 1,320 women were screened between June 24 and October 24, 1986. Data were abstracted from the medical records of all but 19 of these women. Data collected included: age, marital status, race/ethnicity, reason for the visit, gynecologic history, present contraceptive use and level of current sexual activity, current symptoms, partner symptoms, physical findings, test results, and clinician diagnosis.

Chlamydiazyme test result was cross tabulated with these variables; prevalence odds ratios (POR) with 95% confidence intervals (CI) were calculated. All variables found to have POR with a lower limit on the 95% CI greater than one were subsequently used in a logistic regression (BMDPLR).[3]

Results

Of the 1,320 women tested, 75 (5.7 percent) had positive Chlamydiazyme tests. Thirty-six (5.0 percent) of the 724 routine visit group women had positive Chlamydiazyme tests while 39 (6.8 percent) of the 577 symptom/problem group women had positive tests.

Seventy-four of the 75 women with positive tests at their first study period visit returned for treatment; 65 of the 74 treated women returned for a culture test of cure. All 65 were successfully treated.

Table 1 lists those variables which were related to Chlamydiazyme result for the total sample. In the logistic regression, only five of the 13 variables were independently related to a positive test.

Recognizing that a logistic regression equation is likely to be too complicated for most clinicians to apply, a risk-factor index similar to those used by others[4,5] was constructed by summing presence of positive findings on each of the five independently related variables. Thus, women with none of the findings were assigned a score of 0, and women with all five of the findings were assigned a score of five. Table 2 lists sensitivity, specificity, and predictive values using different scores on the index as cutpoints.

Parallel analyses to those conducted for the total sample were conducted separately for women who were seen for routine visits, and those who were seen for problem/symptom visits. Results were not substantially different, but are available upon request.

Discussion

Prevalence rates of chlamydial infection among female college students have ranged between less than 5 percent to nearly 10 percent.[6–14] The 5.7 percent prevalence of cervical infection we observed is at the low end of this range. However, our prevalence among women age 22 years and younger in our study was 8.7 percent; the relatively large number of older students in our study may account for the lower rate.

The literature is divided over whether medical history and examination are adequate to identify infection.[12,14] In our study, if only women who had one or more of the risk factors found to be independently related to a positive test had been screened, 694 women would not have been screened at a significant savings in resources, and 81 percent of the women

Address reprint requests to C. Kevin Malotte, DrPH, Research Coordinator, Student Health Service, and Adjunct Assistant Professor, School of Public Health, A2-130 Center for Health Sciences, University of California-Los Angeles, Los Angeles, CA 90024-1703. Dr. Wiesmeier is Director of Student Health Service and Associate Clinical Professor, School of Medicine, UCLA; Ms. Gelineau is Nurse Practitioner, Student Health Service, UCLA. This paper, submitted to the Journal February 9, 1989, was revised and accepted for publication August 2, 1989.

TABLE 1—Rates of Positive Chlamydiazyme Tests Related to Selected Demographic, History, Symptom, and Examination Variables

Variables	All Subjects N	Percent Positive	Prevalence Odds Ratio (95% CI)
Marital status			
Not married	1096	6.1	2.7
Married	129	2.3	(0.8,8.8)
Age (years)			
22 or younger	462	10.0	3.1
23 or older	839	3.5	(1.9,5.0)**
Sexually active past 3 months			
No or not noted	494	3.6	2.0
Yes	807	7.1	(1.2,3.5)
New partner past 3 months			
No or not noted	1163	5.0	2.7
Yes	138	12.3	(1.5,4.9)**
Multiple partners past 3 months			
No or not noted	1229	5.2	3.3
Yes	72	15.3	(1.7,6.6)
Taking oral contraceptive			
No	831	4.7	1.7
Yes	470	7.7	(1.1,2.7)
Using condoms			
No	1164	6.2	2.9
Yes	137	2.2	(0.9,9.4)
Partner present symptoms			
No or not noted	1240	5.1	4.6
Yes	61	19.7	(2.3,9.1)
Cervix normal on examination			
No	77	15.6	3.4
Yes	1218	5.2	(1.7,6.8)
Cervix bleeds easily			
No	1263	5.3	6.0
Yes	32	25.0	(2.6,13.7)**
Cervix red			
No	1267	5.5	3.9
Yes	27	18.5	(1.4,10.6)
Wet mount—yeast			
No	1090	6.3	2.3
Yes	209	2.9	(1.0,5.4)
Wet mount—bacterial vaginosis			
No	1217	4.8	5.2
Yes	82	20.7	(2.9, 9.4)**
Wet mount—white blood cells			
No	1254	5.2	5.2
Yes	45	22.2	(2.5,10.7)
Diagnosis—normal examination			
No	621	7.7	2.0
Yes	678	4.0	(1.2,3.2)
Diagnosis—possible chlamydia			
No	1265	5.0	10.4
Yes	34	35.3	(5.0,21.5)**

**Variables independently related to Chlamydiazyme result in logistic regression

with a positive test would have been tested. However, 14 (19 percent) of the 75 women with positive tests would have been missed. In our sample, 27 (36 percent) of the 75 women with positive tests had entirely normal physical examinations. Thus it appears while signs, symptoms, history, and demographic variables would be helpful in determining whether to test for infection when laboratory resources are limited, these variables are insufficient to predict infection *accurately*.

Seven guidelines for determining whether a screening program is likely to be effective have been proposed.[15] If a randomized clinical trial has shown the effectiveness of a screening program, the assessment is relatively easy. We are unaware of any randomized trials of screening for chlamydial infection. However, we believe a screening program in our female population satisfactorily satisfies the other six guidelines.

For example, several tests are available which could be used to screen for *chlamydia*. We chose to use Chlamydiazyme, which has compared favorably with culture in our population.[10] The importance of the screening test and the prevalence of the condition is especially important when considering possible negative effects of a screening program. Using the specificity (99.5 percent) and prevalence (4.9 percent) found in our previous studies,[10] less than one out of 10 women who are told they are infected will be erroneously told so.

The costs of alternative strategies for screening during routine gynecologic visits were recently analyzed.[16] A strategy using no screening was compared with a strategy involving the routine use of culture, and a strategy using a less costly but less sensitive and specific alternative test. The analysis indicated that the alternative test would need to cost about $10 per test at a prevalence of 5 percent for the screening strategy to be cost effective. Because our screening test is both more sensitive and specific than the estimates used in that analysis, and our cost per test is less than $8, it appears that screening among our population can be supported on economic as well as clinical grounds.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the helpful comments made by Dr. Robert Haile on earlier drafts of this manuscript. A version of this paper was presented at the 67th Annual Meeting of the American College Health Association, Washington, DC, May 1989.

REFERENCES

1. Thompson SE, Washington AE: Epidemiology of sexually transmitted Chlamydia trachomatis infections. Epidemiol Rev 1983; 5:96–123.

TABLE 2—Prediction of Positive Chlamydiazyme Result Using Different Levels of Risk Factor Index—All Subjects

Risk Factor Index Score	N	% Positive	% Sensitivity*	% Specificity*	% Positive Predictive Value*	% Negative Predictive Value*
0	694	2.0				
1 or More	599	10.2	81.3	55.8	10.2	98.0
0 or 1	1172	4.3				
2 or More	121	20.7	33.3	92.1	20.7	95.7
2 or Less	1270	5.0				
3 or More	23	47.8	14.7	99.0	47.8	95.0

*Compared to Chlamydiazyme result—predictive values based on observed prevalence

2. Centers for Disease Control: Chlamydia trachomatis infections: Policy guidelines for prevention and control. MMWR 1985; 34(3S):53S–74S.
3. Dixon WJ, Brown MB, Engelman L, Frane JW, Hill MA, Jennrich RI, Toporek JD: BMDP Statistical Software, 1983. Berkeley, CA: University of California Press, 1983.
4. Handsfield HH, Jasman LL, Roberts PL, Hanson VW, Kothenbeutel RL, Stamm WE: Criteria for selective screening for Chlamydia trachomatis infection in women attending family planning clinics. JAMA 1986; 255:1730–1734.
5. Kent GP, Harrison HR, Berman SM, Keenlyside RA: Screening for Chlamydia trachomatis infection in a sexually transmitted disease clinic: Comparison of diagnostic tests with clinical and historical risk factors. Sex Transm Dis 1988; 15:51–57.
6. McCormack WM, Alpert S, McComb DE, Nichols RL, Semine DZ, Zinner SH: Fifteen-month follow-up study of women infected with Chlamydia trachomatis. N Engl J Med 1979; 300:123–125.
7. Bowie WR, Borrie-Hume CJ, Manzon LM, Fawcett A, Percival-Smith RKL, Jones HD: Prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae in two different populations of women. Can Med Assoc J 1981; 124:1477–1479.
8. Wiesmeier E, Lovett MA, Forsythe AB: Chlamydia trachomatis isolation in a symptomatic university student population. Obstet Gynecol 1984; 63:81–84.
9. Wiesmeier E, Bruckner D, Black M: Detection of Chlamydia trachomatis infection by direct immunofluorescence staining of genital secretion. Obstet Gynecol 1987; 69:347–349.
10. Wiesmeier E, Bruckner DA, Malotte CK, Manduke L: Enzyme-linked immunoabsorbent assays in the detection of Chlamydia trachomatis: How valid are they? Diagn Microbiol Infect Dis 1988; 9:219–223.
11. Swinker M: Chlamydia trachomatis genital infections in college women. J Am Coll Health 1986; 34:207–209.
12. Harrison HR, Costin M, Meder JB, Bownds LM, Sim DA, Lewis M, Alexander ER: Cervical Chlamydia trachomatis infection in university women: Relationship to history, contraception, ectopy, and cervicitis. A J Obstet Gynecol 1985; 153:244–251.
13. Pereira CA, Paquette GE, Wood PB, Grant SA: Clinical and laboratory screening of Chlamydia trachomatis in women at a university health service. J Am Coll Health 1987; 36:39–43.
14. Kaplan JE, Meyer M, Navin J: Chlamydia trachomatis infection in a female college student population. J Am Coll Health Assoc 1988; 36:294–296.
15. Cadman D, Chambers L, Feldman W, Sackett DL: Assessing the effectiveness of community screening programs. JAMA 1984; 251:1580–1585.
16. Phillips RS, Aronson MD, Taylor WC, Safran C: Should tests for Chlamydia trachomatis cervical infection be done during routine gynecologic visits?: An analysis of the costs of alternative strategies. Ann Intern Med 1987; 107:188–194.

Prevalence of Markers for Hepatitis B and Hepatitis D in a Municipal House of Correction

M. Anita Barry, MD, MPH, Donna Gleavy, RN, Kay Herd, RN, MPH, Pamela J. Schwingl, MS, MA, and Barbara G. Werner, PhD

Abstract: Following an outbreak of hepatitis B (HBV) in a municipal house of correction, HBV markers were detected in 173/406 (43 percent) inmates and 10/129 (8 percent) staff. Of the 173 HBV-infected inmates, 14 (8 percent) had hepatitis D (HDV) markers compared to 0/10 staff members. Intravenous drugs use (IVDU) was most strongly associated with HBV marker presence. Increasing duration of imprisonment, history of hepatitis B and especially IVDU were associated with the prevalence of HDV markers. (*Am J Public Health* 1990; 80:471–473.)

Introduction

Hepatitis D (HDV) is caused by an incomplete RNA virus dependent on hepatitis B virus (HBV) for survival.[1,2] Estimates of its prevalence range from 0–10 percent in chronic HBV carriers to 30–50 percent in persons with fulminant hepatitis B.[3] Most data suggest that in the United States intravenous drug users and hemophiliacs are at increased risk for HDV.[4] Although higher prevalence of HBV markers in prisoners or inmates of correctional facilities when compared to the general population has been described in several studies, similar data on HDV in incarcerated populations are not available.[5–10]

In January 1985, the Boston Department of Health and Hospitals was notified that five inmates in the Suffolk County House of Correction had an acute onset of hepatitis B. One inmate was coinfected with HDV and died of fulminant hepatitis. All inmates and employees were offered HBV screening and subsequent vaccination if seronegative as part of an outbreak control plan. While providing epidemiological assistance, we had the opportunity to evaluate the HDV status in those with HBV markers.

Methods

The Suffolk County (Massachusetts) House of Correction at Deer Island, operated by the City of Boston Penal Institution Department, accommodates 460–480 inmates, who serve an average sentence of 11 months. There are approximately 210 staff members employed at the facility, including two registered nurses and one part time physician who staff an on-site infirmary.

In February 1985, a fact sheet on HBV and HDV was distributed to all inmates and staff, and participation in an HBV screening and vaccination program was solicited. Participants were questioned by one of the investigators regarding age, duration of involvement with the prison system, history of prior hepatitis, history of intravenous drug use (IVDU), location within the prison facility, and primary city of residence.

Serum was obtained to determine presence of HBV core antibody (anti-HBc; CORAB, Abbott Laboratories, N. Chicago, Illinois). Sera with borderline anti-HBc results were also tested for hepatitis B surface antigen (HBsAg) and antibody (anti-HBs) (AUSRIA and AUSAB, respectively, Abbott Laboratories). All anti-HBc positive specimens were also analyzed for HDV antibody (anti-delta; Abbott Laboratories). An interpretation of test results was given to each participant and HBV vaccination offered to those without HBV markers. This protocol was approved by the Boston Department of Health and Hospitals Institutional Review Board.

The magnitude of relative effect was assessed for several risk factors of HBV positivity. Univariate and multivariate

From the Community Infectious Disease Epidemiology Program, Boston Department of Health and Hospitals (Barry, Gleavy, Herd, Schwingl); the Epidemiology and Biostatistics section, Boston University School of Public Health (Barry); and the State Laboratory Institute, Massachusetts Department of Public Health and Tufts University School of Medicine (Werner). Address reprint requests to M. Anita Barry, MD, MPH, Director, Community Infectious Disease Epidemiology Program, Boston City Hospitals, HOB 3, 818 Harrison Avenue, Boston, MA 02188. This paper, submitted to the Journal October 7, 1988, was revised and accepted for publication August 7, 1989.