Prevalence of and Risk Factors for Chlamydia in a Rural Pregnant Population

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Background. *Chlamydia trachomatis* infection is the most common sexually transmitted bacterial disease in the United States. Perinatal infection with *C trachomatis* has been associated with preterm labor, preterm rupture of membranes, stillbirth, and both conjunctivitis and pneumonia in newborns. Little is known about the prevalence of *C trachomatis* infection in rural pregnant women.

Methods. We completed a retrospective chart analysis of 347 obstetric patients in a rural family practice residency training program to determine the prevalence, associated risk factors, and screening criteria for cervical *C trachomatis* infection.

Results. The prevalence of *C trachomatis* infection in our study was 9.0%. Factors predictive of a positive test for *C trachomatis* infection included single marital status, African-American race, history of sexually transmitted diseases, presence of gonorrhea during the current pregnancy, age less than 20 years, and late onset of prenatal care.

Conclusions. The prevalence of *C trachomatis* in this rural obstetric population emphasizes the importance of laboratory screening of rural pregnant women for this disease.

Key words. *Chlamydia trachomatis;* pregnancy complications, infectious; rural population; guidelines.
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Chlamydia trachomatis infection is the most common sexually transmitted bacterial disease in the United States.[1,2] The prevalence of *C trachomatis* in pregnant patients ranges from 2% to 31%,[3,4] but most studies limit the range to between 8% and 12%.[5] Its potential effect on newborns and pregnancy outcome make the disease a significant health concern in obstetric care. Approximately one in three infants exposed to *C trachomatis* at the time of delivery will develop conjunctivitis, and one in six infants will develop pneumonia. Perinatal infection with *C trachomatis* has been associated with preterm labor, preterm rupture of membranes, and stillbirth.[6–10]

Information on risk factors for *C trachomatis* in pregnant women is limited. Previous studies have identified risk factors in a primarily nongravid population.[11–13] A recent review of the medical literature also suggests a rural-urban disparity in the prevalence of *C trachomatis* in pregnancy.[14,15] Ferris and Litaker[16] found a 21% prevalence of infection in rural patients in Georgia, compared with 12% in urban patients. In a study of 2100 women in West Virginia, however, Glover and colleagues[15] found a greater tendency for positive antigen tests to occur among women living in urban areas. The overall prevalence of *C trachomatis* in their study was less than 6%.

No consensus currently exists concerning *C trachomatis* screening in pregnancy. The current Centers for Disease Control and Prevention (CDC) guidelines[2] recommend screening all patients in the third trimester of pregnancy for *C trachomatis.* Recent technical bulletins from the American College of Obstetricians and Gynecologists (ACOG),[7,17] however, suggest that selective screening of pregnant women be done in the first trimester based on such risk factors as age younger than 25 years, history or presence of a new sexually transmitted disease, a new sexual partner in the past 3 months, multiple sexual partners, unmarried, or late prenatal care.

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ACOG also recommends a second screening test in the third trimester for women at continued high risk of *C trachomatis* infection.

The purpose of this study was to establish the prevalence of *C trachomatis* infection and associated clinical characteristics in a rural pregnant population. The study design was based in part on CDC recommendations that periodic surveys of *C trachomatis* prevalence be conducted to confirm the validity of screening recommendations in specific clinical settings.[2] This information might help to develop screening criteria for a rural population. We also examined data for the presence of separate characteristics that might identify women who would benefit from a second screening in the third trimester.

Methods

The University of Tennessee Family Practice Center is a residency training program serving an eight-county region in rural west Tennessee. All patients in the study were from a rural population located outside Jackson, Tennessee (Carroll, Chester, Crockett, Gibson, Hardeman, Haywood, Henderson, and Madison counties, whose rural populations range from 200 to 10,000).

The charts of all rural women who attended the clinic for prenatal care and had expected dates of confinement between January 1992 and January 1994 were analyzed retrospectively. Two cases were excluded because of premature delivery before 26 weeks' gestation. Both of these patients had negative *C trachomatis* cultures. Cases were also excluded if either ethnicity or gestational age by trimester was unknown. A total of 347 cases were analyzed.

All prenatal patients seen during the study period were screened for *C trachomatis* and gonorrhea at their first visit and again in the third trimester. Women who presented in the third trimester for their first prenatal visit were screened only once. The Gen-Probe PACE 2 DNA probe was used for screening (Gen-Probe Pace 2 Chlamydia Trachomatis, Gen-Probe, Inc, San Diego, Calif). The Gen-Probe is a rapid DNA probe test that uses nucleic acid hybridization to detect *C trachomatis* in cervical specimens. This probe has a sensitivity and specificity similar to tissue culture for the detection of *C trachomatis*, even in a population with a low prevalence. The sensitivity was 91% and the specificity 97% in a population with an 8% prevalence rate.[18] Twenty-eight physicians in the residency program screened patients. All residents and faculty received instruction on the proper use of the probe to ensure baseline consistency.

Patients were also screened for syphilis with a rapid plasma reagin (RPR) test, and a visual inspection was made for condyloma and herpes. Human papillomavirus (HPV) infection was also seen on the Papanicolaou (Pap) smear as HPV or koilocytotic changes. *Trichomonas* was identified by its presence on the Pap smear, in the urinalysis, or in the wet prep in symptomatic women.

Each of the variables established by recommendations from the CDC[2] and ACOG[7,17] was tabulated: (1) age younger than 20 years; (2) unmarried; (3) history of other sexually transmitted diseases; and (4) late prenatal care. The relative contribution of each of these variables, as well as insurance coverage, parity, presence of gonorrhea, race, and positive *Trichomonas* test, to a positive *C trachomatis* test was measured by chi square or Fisher's exact test and logistic regression. Descriptive statistics were used on demographic data.

Table 1. Demographic Characteristics of Study Population (N=347)

Characteristics	Patient Population, %
Age, y	
14–19	17.6
>20	82.4
Race	
White	75.3
Black	24.7
Marital status	
Married	52.2
Single	39.5
Separated/divorced	8.3
First prenatal visit	
First trimester	45.9
Second trimester	49.7
Third trimester	4.3
Medicaid	
Yes	89.0
Parity	
1–3	62.9
>3	37.1
History of STD	
No	88.1

NOTE: Percentages may not total 100 because of missing data.
STD denotes sexually transmitted disease.

Results

Population characteristics are listed in Table 1. The average age of the study population was 23 years, range 14 to 41. Most patients were white, married, and receiving Medicaid. More than 54% of patients presented for their first prenatal visit when gestational age was greater than 13 weeks.

Twenty-nine (8.4%) of the women in the study had a positive *C trachomatis* test at some point during their

Table 2. Risk Factors Associated with a Positive *C trachomatis* Screening Result

Risk Factor	Odds Ratio (95% CI)	*P* Value
First prenatal care after 13 weeks' gestational age	2.96 (1.07–8.17)	.04
African-American	3.30 (1.24–8.77)	.02
Parity <3	5.85 (1.29–26.46)	.02

CI denotes confidence interval.

pregnancy. Ten (2.9%) of the women were positive only on the second screening, and two (0.6%) were positive on both screenings.

Using chi-square analysis, the following variables were found to be statistically significant predictors of a positive *C trachomatis* test result: parity less than three, single marital status, African-American, history of previous sexually transmitted disease, positive screening result for gonorrhea during this pregnancy, Medicaid insurance coverage, age younger than 20 years, and presentation for prenatal care sometime after the first trimester. The later the presentation for care after the first trimester, the higher the prevalence of *C trachomatis* infection.

A positive *C trachomatis* test result was independent of a history of drug use, Pap smear results, or a history of genital herpes infection. Of the 347 patients who participated in the study, 13 had a history of herpes, but at the time of admittance, the herpes was inactive. The best logistic regression model for predicting *C trachomatis* infection included presentation for prenatal care when gestational age was greater than or equal to 13 weeks, parity less than three, and race African-American (Table 2). There was no interaction among these variables according to a lack-of-fit test (χ^2=12.8; degrees of freedom [*df*]=9; *P*>.05).

Discussion

This study emphasizes the importance of screening rural pregnant women for *C trachomatis*, especially those with lower socioeconomic status, as measured by insurance status. We found a prevalence rate of 9.0% in our rural population. Although our study found a substantially lower prevalence rate than did that of Ferris and Litaker[16] (21%), it suggests clinically significant rates of *C trachomatis* infection in pregnant women in rural areas. We were unable to substantiate previously cited rates of 21% to 31% in rural pregnant populations.[4] These differences could be explained by variations in sample size, regional variation in the population, and how investigators defined their rural populations. Previous studies have shown that it is cost-effective to screen for *C trachomatis* when the prevalence rate exceeds 6%.[19]

Our study confirmed risk factors consistent with screening criteria recommended by the CDC[2] and ACOG,[17] ie, age younger than 25 years, single marital status, history of sexually transmitted diseases, and late prenatal care. Our best-fit regression model included late prenatal care, parity less than three, and African-American race to be predictive of a positive *C trachomatis* screening result.

The association between gonorrhea and *C trachomatis* is well documented in the nonpregnant population.[2,17] This association in pregnancy was confirmed in our study, even though we were limited by the small number of women with gonorrhea (9 of 347). Forty-five percent of our patients with a positive test result for gonorrhea also had *C trachomatis* (4 of 9). We were not able to confirm the findings of other investigators who demonstrated an association between *C trachomatis* and inflammation on Pap smears.[20]

We were interested in women who were positive only on the second test because they could be missed if screened only once during their pregnancy. Eight of 10 women with a positive second *C trachomatis* screening result had been negative on their first screening. Several factors could explain the negative result on the first test, including Gen-Probe testing or infection after the initial screening.

Although fairly consistent data were recorded in the patient charts, our study was limited by its retrospective nature. Information concerning the number of sexual partners was not available. We could not definitely determine from the chart review whether the sexual partner had been treated, although in this community all positive *C trachomatis* results have contact follow-up and treatment by the health department. In addition, the small numbers used in some of our data analyses would limit conclusions.

We were unable to determine separate clinical characteristics that would identify women who had a negative screening result earlier in their pregnancy but who needed additional screening in the third trimester, as recommended by ACOG.[17] The CDC[2] suggests screening only in the third trimester, given the limited evidence that there are adverse effects of *C trachomatis* infection early in pregnancy. Women with a history of sexually transmitted diseases or concurrent gonorrhea, however, were identified as having a much higher risk for *C trachomatis* infection in this patient population. Because the natural history of *C trachomatis* infections in pregnant women is still unknown,[21] we believe that an initial screening test should take place early in the course of prenatal care. A second test is unnecessary in women identified as having lower risk, eg, those who are white, married, have a negative history of sexually transmitted diseases, or who present in their first trimester for prenatal care.

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