

Incidence of Infections with *Chlamydia trachomatis* among High School Students

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Abstract

Background: Infections with *Chlamydia trachomatis* are highly prevalent among adolescents, but their incidence has not been well studied.

Objectives: To determine the incidence of *C trachomatis* infections in an initially chlamydia-free high school student population.

Methods: Between 1995 and 2007, 7990 students in an urban US high school district were tested for *C trachomatis* more than once in an annual school-wide screening using urine DNA amplification tests. Students testing positive were treated with 1g azithromycin orally under direct observation. Incidence rates were calculated among 7292 students (Females: 3506; Males: 3786) aged 14 to 19 at their first participation in screening.

Results: The average annual cumulative incidence was 5.6% among males and 8.9% among females (p<.0001). The average incidence rate was 6.5/100 person-years (p-yrs) for males and 11.4/100 p-yrs for females (p<.0001). The incidence rate was 8.2/100 p-yrs among students whose test result at first participation was negative compared with 30.3/100 p-yrs among students whose test result at first participation was positive (p<.0001). Among students whose test result at first participation was negative, the median incidence time from the date of their initial negative test was 11.4 months for males and 8.7 months for females. Among students whose test result at first participation was positive, the median incidence time from the date of treatment was 6.2 months for males and 6.2 months for females.

Conclusions: While these incidence rates, cumulative incidence, and incidence times support current recommendations for annually screening female adolescents of chlamydia, they also provide strong evidence in support of annual chlamydia screening for male adolescents.

Background

- Infections with *Chlamydia trachomatis* are the most commonly reported notifiable diseases in the United States.
- Every year, the rates of chlamydia reported to the Centers for Disease Control and Prevention are highest among teenage adolescents and young adults under the age of 25 compared to individuals in other age groups.
- Because more than 90% of chlamydial infections may remain asymptomatic, many infections can only be detected through proactive screening.
- Although recommendations for screening adolescent females have been developed, to date, no recommendations for screening males have been developed.
- The recommendations to screen female adolescents annually are based on observations of the rates at which individuals who have been tested for chlamydia, mainly in clinical settings, acquired a new infection.

Objectives

- To determine the cumulative incidence and the incidence rate for chlamydia among high school students in a New Orleans public school district.
- To determine time to infection among students with an initial negative chlamydia test result.
- To determine time to re-infection among students with an initial positive chlamydia test result or among students previously treated for chlamydia.

Methods

SETTING AND DESIGN

- Students in selected high schools in a New Orleans public school district were offered a school-based screening for chlamydia and gonorrhea using DNA amplification tests in urine specimens.
- The screening was first implemented in the school district during the school year 1995-1996 and was offered each subsequent school year until the school year 2006-2007.
- All students in the participating schools were eligible for testing if they had parental consent. Consent was sought from all students each year, regardless of prior participation.
- Consent was obtained in writing or verbally by telephone from parents/guardians of all students under the age of 18.
- Students 18 years old or older provided their own consent in writing.

SCREENING PROTOCOL

- During the testing period, entire classes of students were escorted to the designated testing area (a vacant classroom, an auditorium..)
- Each eligible student was counseled individually regarding the opportunity to participate in the testing.
- Students whose parents have not provided consent were sent back to their classroom without being tested.
- Students having consent and willing to participate were given a urine collection cup and asked to collect the first 30 ml of the urine stream.
- Specimens were delivered to the laboratory on the same day for testing using a DNA amplification assay.
- Students with a positive test result were considered infected.

COUNSELING AND TREATMENT

- Using standing orders, treatment was provided to infected students by a nurse/physician under direct observation with azithromycin 1g orally for chlamydia and ciprofloxacin 500mg orally for gonorrhea (cefixime 400mg was used before its production and marketing were discontinued).
- Infected students were counseled and asked to seek additional STD examination and HIV testing with their physicians or at the city STD clinic.
- They were also asked to refer their sex partners to the city STD clinic for treatment. Partners enrolled in the same school could obtain treatment at school from the nurse/physician.

CONFIDENTIALITY ISSUES

- Students were offered testing regardless of sexual activity, STD symptoms, or prior history of an STD.
- All specimens were identified only using pre-printed bar codes.
- Students were provided test results confidentially and individually.
- Parents could not obtain results from the program; they could however obtain results directly from their children.

DATA ANALYSIS

- The incidence of chlamydia and times to infection were calculated among 7292 students who participated in the screening more than once and whose initial test was negative, and among students retested during a subsequent school year after having been treated for a chlamydial infection in a previous school year.
- Data are reported for students who were aged 14 to 19 at their initial participation in screening.

Results

Table 1. Cumulative incidence, incidence rates, and incidence times			
	Males	Females	Total
Cumulative Incidence (Average annual, %)			
First test (-)*	5.4*	8.4*	6.8
First test (+)/Retested after a (+) test	13.9	16.8	15.8
All*	5.6*	8.9*	7.2
Incidence rates (per 100 person- years)			
First test (-)*	6.2*	10.7*	8.2
First test (+)/Retested after a (+) test	29.0	31.0	30.3
All*	6.5*	11.4*	8.8
Incidence times (months)			
Mean			
First test (-)**	14.1*	12.2*	13.0
First test (+)/Retested after a (+) test**	9.9	9.9	9.9
All*	13.8	12.0	12.7
Median			
First test (-)	11.4	8.7	9.7
First test (+)/Retested after a (+) test	6.2	6.2	6.2
All*	10.9	8.4	8.9

-Cumulative incidence=[(Incident Infections/Total observed)x100]/2 (the median duration of student participation in screening was 2 years).
-Incidence rate=(Incident infections/follow up)x100 and is expressed in 100 person-years of observation.
-Incidence time was determined among students with an initial negative test as the time between the date of the initial negative test and the acquisition of the incident infection; among students with an initial positive test or with a retest after a positive test, it was the time between the date of treatment for a previous chlamydia infection and the acquisition of repeat infection; an incident infection was estimated to occur mid-way between the most recent negative test or the date of previous treatment for chlamydia and the date of testing that came back positive.
*p<0.005 for comparisons between males and females.
**p=0.004 for comparisons within gender between first tests (-) and first tests (+)/retested after a (+) test.

Conclusions

- In this high school student population, there is a high incidence of chlamydia among both males and females.
- The incidence among females is approximately twice that among males.
- There are no significant differences in re-infection rates between males and females.
- Within a year of testing negative for chlamydia, more than half of males and females acquired an incident infection with chlamydia in the school district.
- Within six months following treatment for a positive chlamydia test, approximately one half of males and females had a repeat positive test in the school district.
- Although some of the repeat positive tests may represent treatment failures, most are likely re-infections from untreated and/or new sex partners.
- Adolescents treated for chlamydia as part of high school screening programs should be retested periodically and school-based STD screening programs must explore means to enhance partner treatment and other partner management services to maximize population benefits of these programs.
- Recommendations for annually screening sexually active adolescent females for chlamydia have been developed, but no recommendations for screening males have been developed.
- The rate at which an incident chlamydia infection was acquired in both males and females in this sample of a general population indicates that in areas of high prevalence of STDs, annual screening for chlamydia for adolescent males may be indicated.