

Knowledge of *Chlamydia Trachomatis* Assessed in a Puerto Rican Medical Student Population

Ronald López-Cepero, MD*; Juan A. Flores, MD†; Josefina Romaguera, MD, MPH*

Objective: The knowledge of medical students in Puerto Rico with regard to the *Chlamydia trachomatis* infection has not been formally assessed. The purpose of this study was to make such an assessment as it is the members of this group who will eventually educate and inform patients about this and other health-care issues.

Methods: The sample was drawn from a population of students enrolled in a four-year medical school program in Puerto Rico. Data were collected via a self-administered one-page questionnaire and took approximately 5 minutes to complete. The questionnaire was a 9-item inventory composed mostly of knowledge items. A frequency count for each item was calculated. The SPSS program was used for the statistical analysis.

Results: A final response rate of 76% (338/455) was obtained for the analysis. The sources of chlamydial information were college (73.4%), high school (59.8%), friends (28.1%), press media (21.6%), and family members (15.4%). Asked to identify the etiology of the infection, participants responded that it was bacterial (78.1%), viral (16.9%), parasitic (3.8%), or fungal (1.2%). Knowledge about the existence of a cure for the infection resulted in 85.5% of the respondents answering in the affirmative, that a cure exists; the rest either did not know or were uncertain about the existence of a cure for Chlamydia. Knowledge regarding the mode of transmission resulted in 98.2% stating that it is transmitted sexually, while public bathrooms as a source of infection accounted for 2.4%; kissing (1.5%) was also identified as a method of transmission. Statistics for the symptoms and the consequences of chlamydia resulted in pelvic inflammatory disease (PID) (81.1%), infertility (75.1%), abnormal vaginal secretions (79.6%), burning sensation upon urination (49.6%), ectopic pregnancies (44.9%), abnormal vaginal bleeding (13.9%), and cervical cancer (8.9%).

Conclusion: Our data suggest that members of this population understand this infection only partially and that there is indeed a lack of knowledge regarding infection of sexually transmitted *Chlamydia trachomatis*. Without accurate knowledge of chlamydial infection, medical students and physicians are unable to identify its presence and, subsequently, educate their patients regarding both the management and the serious complications of this infection. There are serious implications for women's health, and thus knowledge is important to reduce the burden of chlamydial infection. [*PR Health Sci J* 2011;1:18-21]

Key words: *Chlamydia trachomatis*, Sexually transmitted diseases, Cervical cancer, Public health, Medical students

C*hlamydia trachomatis* is an intracellular gram-negative bacterium. It resides in the columnar epithelium of the female's lower genital apparatus (1, 2) and is the most common bacterial sexually transmitted disease in the United States (3) with an incidence of 3 to 4 million new cases per year (4). In Puerto Rico in 2008, the rate of this disease among women 15 to 24 years of age was 15.2% in prenatal clinics and 12.9% in STD centers (5). Sexually transmitted *Chlamydia trachomatis*

*Department of Obstetrics and Gynecology, University of Puerto Rico School of Medicine, San Juan, Puerto Rico; †University of Puerto Rico School of Medicine, San Juan, Puerto Rico

The authors have no conflicts of interest to disclose.

Address correspondence to: Ronald López-Cepero, MD, Department of Obstetrics and Gynecology, School of Medicine, University of Puerto Rico Medical Sciences Campus PO BOX 365067, San Juan, PR 00936-5067. Tel: (787) 396-5068 • Email: ronald.lopez-cepero@upr.edu

infection causes major morbidity in infected patients, and it has become a main issue in public health for the last decades. Being able to diagnose an infected person has been demonstrated as an efficient method for decreasing long-term morbidity (6). In women the signs and symptoms are often non-specific. These symptoms may include abnormal vaginal secretions, irregular menstruation, pelvic pain, a burning sensation upon urination, and pain during intercourse (7). Because this infection is frequently asymptomatic, many women bear the brunt of its consequences, that is, they are often subject to diseases of the female reproductive organs that arise later in life. Pelvic inflammatory disease (PID), ectopic pregnancy, and infertility due to tubal damage are the most well known associations to chlamydial infection (8). In addition, chlamydia can enhance the spreading of the human immunodeficiency virus (HIV) (9). Studies by Antilla et al. have provided evidence that infection by *Chlamydia trachomatis* is an independent risk factor for the progression of invasive squamous cell carcinoma of the cervix, all this due to the presence of serum antibody titers persisting chronically over a period of years (10).

The deficit of knowledge within the medical community regarding the consequences and management of this sexually transmitted disease is one of the possible reasons for there being poor diligence when it comes to the matter of dealing with chlamydial infection. That we are aware, there are no data regarding the knowledge that medical students may or may not possess about the sexually transmitted *Chlamydia trachomatis* infection. The purpose of this study was to assess this knowledge, as it is the members of this group who will eventually educate and inform patients about this and other issues of health.

Methods

The sample was drawn from a population of students enrolled in a four-year medical school program at the University of Puerto Rico. This population comprised freshmen, sophomores, juniors, and seniors. This should be representative of students at the other medical schools in Puerto Rico as those schools have four-year programs as well. This project was IRB approved, meeting all of the requirements of the institution. A copy of the study's IRB approval and a pamphlet of information about sexually transmitted *Chlamydia trachomatis* infection were given to all of the participants (for educational purposes). A total of 338 subjects participated in the study. Data were collected over a period of two weeks. Questionnaires were completed voluntarily and anonymously. All participants signed an informed consent, agreeing that they understood the purpose and potential benefits of the study.

Data were collected via a self-administered, one-page questionnaire that took approximately 5 minutes to complete. This questionnaire was precisely intended to be answered very quickly and easily in order to increase the number of

respondents and to eliminate the problem of people not wanting to participate due to time constraints. The questionnaire was a 9-item inventory of knowledge, primarily that concerning different aspects of the infection. One of the questions attempted to elicit the respondent's source or sources of information regarding chlamydial infection. Knowledge items focused on mode of transmission, treatment, symptoms, and consequences of the non-treated infection. Finally, the last question was designed to determine whether the students had any knowledge regarding the association linking *Chlamydia trachomatis* and the risk for the development of cervical squamous cell carcinoma. Some questions, such as sources of information, mode of transmission, symptoms of the infection, and the long-term consequences of chlamydia in the female pelvis, had more than one possible answer, and the students were able to choose more than one option in those cases. The questions regarding treatment, etiology of the organism, and knowledge about the association of chlamydia and cervical cancer were close-ended, with only one possible correct choice. A frequency count for each item was calculated. The SPSS program was used for the statistical analysis.

Results

A final response rate of 76% (338/455) was obtained for the analysis. Overall, results demonstrated a variable lack of knowledge of certain aspects regarding chlamydial infection. When asked about their primary source or sources of information, participants named college (73.4%), high school (59.8%), friends (28.1%), the press/media (21.6%), and family members (15.4%). When asked to identify what type of organism caused this infection, 57 of the students (16.9%) answered that the agent was a virus, 13 of them (3.8%) chose the parasite option, 4 of them (1.2%) responded that it was caused by a fungus, and finally, 78.1% answered correctly, indicating the etiologic agent to be bacterial. Some of the students either did not know or thought that there was a cure for this infection (14.5%); the rest of the participants (85.5%) knew with certainty that there was a cure for chlamydial infection. The great majority of respondents knew that the mode of transmission was via sexual contact (98.2%), but surprisingly, 1.5% thought that kissing was a way of transmission and 2.4% thought that sharing public bathrooms may put one at risk of getting infected. Several important misconceptions about chlamydial infection symptoms in women were revealed through the participants' responses. For example, 15.1% said that there was not a single possible sign or symptom that could raise the suspicion for chlamydial infection. The most common symptoms recognized by the subjects were abnormal vaginal secretions (79.6%), followed by a painful or burning sensation while urinating (49.6%), and abnormal bleeding between menses or after coitus (13.9%).

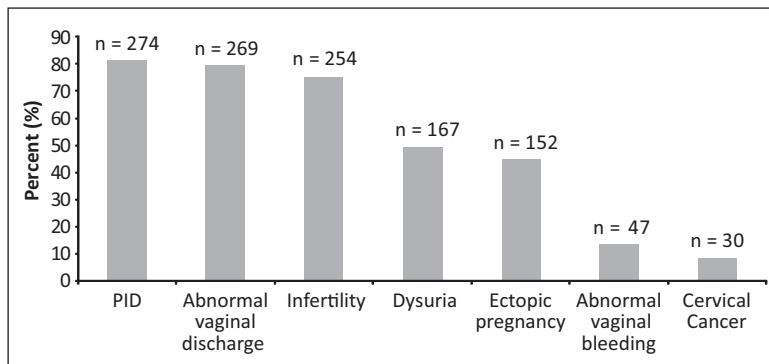


Figure 1. Symptoms and complications of *Chlamydia trachomatis* as identified by study respondents.

Knowledge about the potential consequences of untreated chlamydial infection was partially lacking. The vast majority knew that pelvic inflammatory disease (81.1%) was one of the sequels of this infection, but only 44.9% knew that previous episodes of *Chlamydia trachomatis* could increase the risk of having an ectopic pregnancy. Of the participants, 75.1% knew that this infection could lead to infertility due to fallopian tube damage. Finally, and most surprisingly, only 8.9% of the subjects knew that chlamydial infection increases the risk for the future development of cervical squamous cell carcinoma.

Discussion

The majority of the participants in this study were relatively young (21-35 years). This is generally a sexually active group whose members are exposed and vulnerable to sexually transmitted diseases (11-13). Our data suggest that the members of this population understand this infection only partially and that there is indeed a lack of knowledge regarding infection by sexually transmitted *Chlamydia trachomatis*.

The fact that only 21.6 percent of medical students had heard of Chlamydia via the press/media may indicate that there is a need for a system of public information that will educate the general population about this infection. This may also demonstrate the need for a more aggressive public health effort in order to increase the awareness of the problems associated with this infectious process. Being unable to recognize general symptoms such as abnormal vaginal secretions or problems during urination may result in the poor screening of high-risk patients by this generation (soon to become physicians). Fewer than half of the students made the association between *Chlamydia trachomatis* infection and ectopic pregnancy. More than half of identified ectopic pregnancies occur in women without risk factors (14). The well known association between chlamydial infection and ectopic pregnancy makes a clinician's ability to identify any previous instance of chlamydial infection extremely important. Only 30 of the 338 students identified the association between

previous chlamydial infection and the future risk of developing squamous cell carcinoma of the cervix. Studies by Antilla et al. revealed that multiple exposures to this infection might increase the chances of acquiring one of the chlamydia serotypes associated with carcinogenesis (10). Therefore, it is essential that a physician be aware of the infection's link to this deadly (potential) consequence when counseling patients suffering from chlamydia.

Prevention is a key concept in the control of any public health problem such as chlamydial infection and its associated complications. Knowledge about etiology, mode of transmission, available treatment options,

symptoms, and complications is necessary to establish successful primary, secondary, and tertiary prevention strategies. This study demonstrates a current lack of knowledge and stresses the importance of education as a means to overcome this lack. A recent study demonstrated that medical students who had a curriculum in their school for education in sexually transmitted diseases increased their knowledge as measured by responses to STD questions on the National Board of Medical Examiners (NBME) tests (15). In light of this evidence, education in sexually transmitted disease management and diagnosis, including chlamydia-related issues, should be encouraged in all medical schools as part of their regular education and curriculum, therefore, resulting in a direct benefit to future patients.

The strengths of this study are its large sample size and a questionnaire response rate of 76%, which is very respectable for a student survey. We consider the questionnaire to have been very simple and limited to the basic knowledge that every medical student should have. The primary limitation of the study is that such important details as sociodemographics were not included in the survey. Not determining the respondent's current year in medical school at the time of the survey is another shortcoming, since higher levels in school are associated with increased levels of knowledge. Finally, we recognize that this study represents the population of only one medical school in Puerto Rico, and thus, it may not represent the knowledge of chlamydia among medical students in other regions.

Resumen

Objetivo: El propósito principal de este estudio es estudiar el grado de conocimiento que tienen los estudiantes de medicina sobre *Chlamydia trachomatis*, ya que es uno de los grupos más importantes encargados de educar sobre aspectos de salud en la población general. **Métodos:** La muestra elegida fue de una población de estudiantes de medicina en Puerto Rico dentro de un programa de cuatro años de estudio. Los datos se recopilaban a través de un cuestionario de forma voluntaria que duró alrededor de 5 minutos para completar. El cuestionario constaba de 9

preguntas acerca del conocimiento general sobre clamidia. La frecuencia para cada una de las preguntas fue calculada y se utilizó el programa SPSS para propósitos matemáticos. Resultados: El total de participantes fue de 338/455 estudiantes (76%). La fuente principal de información sobre clamidia la obtuvieron de sus estudios universitarios (73.4%), seguido de la escuela superior (59.8%), amigos (28.1%), prensa (21.6%) y finalmente de su familia (15.4%). El conocimiento sobre la etiología del organismo resultó en una mayoría respondiendo bacteria (78.1%), seguido de virus (16.9%), parásito (3.8%), y hongo (1.2%). De todos los participantes, 85.5% respondió que existía una cura para clamidia, sin embargo el resto desconocía o pensó que no hay cura para esta infección. En cuanto al conocimiento sobre los modos de transmisión, 98.2% respondió que se transmitía sexualmente, 2.4% en baños públicos y 1.5% que se podía transmitir a través de un beso. Los síntomas y las consecuencias reconocidas por los estudiantes sobre la infección fueron: la enfermedad pélvica inflamatoria (81.1%), infertilidad (75.1%), secreciones vaginales anormales (79.6%), ardor al orinar (49.6%), embarazos ectópicos (44.9%), sangrado vaginal anormal (13.9%) y cáncer cervical (8.9%). Conclusión: Nuestros datos muestran que esta población desconoce aspectos importantes sobre la infección causada por *Chlamydia trachomatis*. Sin conocimiento apropiado los estudiantes de medicina y los médicos serán incapaces de poder orientar correctamente a sus pacientes sobre los síntomas, tratamiento y manejo de esta infección.

References

- Kihlstrom E, Danielsson D. Advances in biology, management and prevention of infections caused by *Chlamydia trachomatis* and *Neisseria gonorrhoea*. *Curr Opin Infect Dis* 1994;7:25-33.
- Taylor-Robinson D, Thomas BJ. The role of *Chlamydia trachomatis* in genital tract and associated diseases. *J Clin Pathol* 1980;33:205-233.
- Centers for Disease Control and Prevention (CDC). Sexually Transmitted Diseases Surveillance-2002, Atlanta, GA: CDC; 2003.
- Sexually Transmitted Diseases Surveillance, 2000. Atlanta GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2001.
- Center for Disease Control and Prevention Available at: URL: <http://www.cdc.gov/std/chlamydia2008/state/PR08.pdf>. Accessed April 21, 2010.
- Scholes D, Stergachis A, Heidrich FE, et al. Prevention of Pelvic Inflammatory disease by screening for cervical *Chlamydia trachomatis*. *N Engl J Med* 1996;334:1362-1366.
- White DM, Felts WM. Knowledge of Chlamydial Infection Among University Students. *Health Educ* 1989;7:23-25
- Weinstock H, Dean D, Bolan G. *Chlamydia trachomatis* infections. *Infect Dis Clin N Am* 1994;8:797-819.
- Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. *Sex Transm Infect* 1999;75:3-17.
- Antilla T, Saikku P, Koskela P, et al. Serotypes of *Chlamydia trachomatis* and risk for development of cervical squamous cell carcinoma. *JAMA* 2001;285:47-51.
- Sexually transmitted diseases quarterly report: genital infection with *Chlamydia trachomatis* in England and Wales. *Commun Dis Rep CDR Wkly* 1995;5:122-123.
- Felman YM, Nikitas JA. Nongonococcal urethritis. A clinical review. *JAMA* 1981;245:381-386.
- Cates W, Wasserheit JN. Gonorrhoea, chlamydia and pelvic inflammatory disease. *Curr Opin Infect Dis* 1990;3:10-19.
- Murray H, Baakdah H, Bardell T, et al. Diagnosis and treatment of ectopic pregnancy. *CMAJ* 2005;173(8):905-912.
- Weisenfeld HC, Dennard-Hall K, Cook RL, et al. Knowledge About Sexually Transmitted Disease in Women Among Primary Care Physicians. *Sex Transm Dis* 2005;32:649-653.
- Devonshire P, Hillman R, Capewell S, et al. Knowledge of *Chlamydia trachomatis* genital infection and its consequences in people attending a genitourinary medicine clinic. *Sex Transm Infect* 1999;75:409-411.