Genital Chlamydia Trachomatis Infection in Commercial Sex Workers Attending a Sexually Transmitted Disease Clinic in Hong Kong

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ABSTRACT

A retrospective study of genital chlamydial infection in 400 female commercial sex workers who attended the Yau Ma Tei female Social Hygiene Clinic in 1998 showed an overall prevalence rate of 8%, with a preponderance for young adults and adolescents (age<24). Chlamydia trachomatis was the most commonly detected sexually transmitted pathogen. The majority of chlamydia-positive patients were asymptomatic and one-eighth of them had no cervicitis clinically. Risk factors found to be associated with chlamydial infection included young age and concurrent gonococcal infection. The high prevalence of chlamydial infection in commercial sex workers indicates the need for enhanced screening strategies and public education.

Keywords: *Chlamydia trachomatis*, commercial sex workers, cervicitis, Chlamydiazyme, Hong Kong

INTRODUCTION

Chlamydia trachomatis is the commonest sexually transmitted bacterial pathogen worldwide. In women, genital chlamydial infections may cause severe complications such as pelvic inflammatory disease (PID) leading to serious sequelae including ectopic pregnancy, infertility and chronic pelvic pain. Infants born to infected mothers can develop ocular infections and chlamydial pneumonia.[1-4] Prompt and effective treatment during pregnancy is important. However, early identification of persons infected with chlamydia is difficult because symptoms of the infection are usually non-specific, and up to 70% of infections in women are asymptomatic.[5] Furthermore, infections may persist for several months to years in untreated women. Therefore, the infection, though easily treatable, can still become widely 'prevalent' in a population and impose heavy personal, social and medical service burdens. In 1994, the estimated cost of untreated chlamydial infections and their complications was in excess of US$2 billion in the United States.[6] This highlights the importance to prevent the spread of the infection, and to detect and treat the sub-clinical infection early enough to prevent serious sequelae.

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EPIDEMIOLOGY

In reference to various prevalence studies carried out in selected populations in the developed countries, higher prevalence of genital chlamydial infection was found in the sexually active teenagers (>10%),[7] and patients attending sexually transmitted disease clinics (5-15%).[8] The rate is usually found to be <5% in adult women during routine check-up.[5,9] In the United States, it was estimated that there might be 4 million cases of chlamydial infection annually. Epidemiological data in Hong Kong is limited. Leung et al found a prevalence rate of 2.1% in 95 pregnant women in 1988.[11] In 1991, Lim reported a prevalence rate of 8.9% with preponderance for the late-teenagers (15%) among gynaecological patients.[12]

Commercial sex is a risky activity of both acquiring and transmitting sexually transmitted diseases. In the government sexually transmitted disease (STD) clinics in Hong Kong, most of the female patients acquired the diseases from their partners who have been involved in commercial sex. Therefore, commercial sex workers (CSW) serve as important sources of infection. The prevalence of chlamydial infection among CSW in other

parts of the world varied from 4-37.6% in different studies.[13-18]

In the government STD clinics since 1994, female patients have been routinely screened for cervical chlamydial infection during their first visit. The results of their chlamydial tests and other data can be gathered, analyzed and transformed into valuable information revealing the local scenario of chlamydial infection. This retrospective study is undertaken to determine the prevalence of chlamydial infection, to identify the risk factors and the clinical manifestations in the commercial sex workers attending one government STD clinic in Hong Kong.

METHODS AND MATERIALS

Four hundred and seventeen CSW attended the Yau Ma Tei female Social Hygiene Clinic in 1998. Seventeen of them were excluded from the study either because they did not have commercial sex for 3 months before they last attended the clinic, or had not received any chlamydia test ever since attending the clinic.

- Among the excluded patients, five of them had no commercial sex for latest 3 months, twelve of them had no cervical chlamydia test done either because they had hysterectomy, or vaginal examination could not be performed at first visit due to menstruation and the patients subsequently defaulted follow-up.

The data of the remaining 400 CSW were collected and analyzed to determine the prevalence of chlamydial infection and other sexually transmitted diseases; and to derive risk markers of the infection. However, some documented risk factors such as the use of oral contraceptives, endocervical bleeding, history of previous STD or PID could not be explored in our study because of incomplete recording in medical notes.

This clinic is the largest and most established public female STD clinic in Hong Kong. It mainly serves the lower and middle socio-economic classes of residents. The CSW were interviewed during their first attendance. Demographic data, sexual history and behaviour were recorded.

Gynaecological examination included inspection of the external genitalia, vagina and cervix for any lesion or inflammation. Speculum was used for inspection of the vagina and exocervix. Cervical and urethral smears were taken for Gram-stain examination and gonococcal culture. High vaginal smears were taken for wet mount and cultures for trichomonas and candida. Excessive discharge or mucus was then removed from the exocervix with a large headed swab. To obtain the chlamydia specimen, a tipped cotton swab was inserted into the endocervical canal and rotate for 15-30 seconds and placed immediately into the transport medium supplied by the manufacturer. The specimens were kept at 2-8^{0}C and tested within seven days of collection. A Papanicolaou smear was taken for cervical cytology. Blood was taken for HIV and syphilis serology.

The endocervical specimens were tested for *Chlamydia trachomatis* antigen by enzyme immunoassay (Chlamydiazyme diagnostic kit, Abbott Laboratories).

The disease entity, non-specific genital infection (NSGI), would include those with genital chlamydial infection, and those with mucopurulent cervicitis (MPC) diagnosed clinically with the help of a simple Gram-stained cervical smear. Identification of 10 or more polymorphonuclear cells per oil immersion field (x 1,000) correlates strongly with mucopurulent cervicitis.

STATISTICAL METHODS

Age, sexual activities and behavioral risk factors including working duration as CSW, commercial sex frequency and use of condom, were the independent variables used as predictors of a positive chlamydia test. The result of the chlamydia test was the dependent variable studied. Risk markers were analyzed and included concurrent evidence of gonorrhea. The variables, both continuous and categorical, were assessed using chi-square tests. Differences between chlamydia-positive and chlamydia-negative groups were presented at 90% confidence. Logistic regression was used to develop a predictive model for a chlamydial infection. Although a less stringent significance level of 0.1 (SAS statistical package) is adopted in all tests, it is reasonable in this study because of the relatively small sample size of subjects (chlamydia-positive group) in respect to the controls (chlamydia-negative group) at a ratio of 1:11.

RESULTS

Demographic data, prevalence and manifestations

Data of four hundred CSW were adopted in the analysis (mean age: 31, ranged from 17-65). Sixty-two of them (15.5%) were non-Chinese Asians (59 Thai, 1 Indonesian, 1 Malaysian and 1 Vietnamese). Thirty-two CSW were Chlamydiazyme positive, resulting in an overall prevalence of 8%. Higher detection rates were found among the adolescents and young adults: 13.0% and 17.1% respectively (Table 1). Young age was found to be significantly associated with the infection (P = 0.0684). The demographic and behavioral characteristics of the chlamydia-positive and negative groups were outlined (Table 2). Among all the STD, NSGI was the commonest infection, accounting for 38.8% of cases. *Chlamydia trachomatis*, which accounted for 20.6% of all the cases of NSGI, was confirmed to be the most prevalent bacterial pathogen found in CSW (Table 3). For those suffering from C. trachomatis infection, 65. 6% (21/32) were asymptomatic. The remaining presented with excessive or bloody discharge, genital pain and/or pruritus vulva (Table 4). One-eighth (4/32) of them had macroscopically clear cervical secretions.

Sexual activities and behavioral risk factors

The working duration, commercial sex frequency and the use of condom during sex, both commercial and regular, were found unrelated to the chlamydial infection (P= 0.2158, 0.1847, 0.1216 respectively as shown in Table 5).

Disease Association

Gonorrhea was found in 15.63% (5/32) and 2.45%

Table 1. Distribution of Chlamydia trachomatis infection in CSW by age group

Age group (n=400)	*% (no.) of CSW with positive results*
<19	**13.0 (3/20)**
20-24	**17.1 (7/48)**
25-29	7.8 (8/103)
30-34	7.5 (7/93)
35-39	6.3 (5/80)
40-44	2.7 (1/37)
45-49	0.0 (0/9)
>50	1.4 (1/7)

Table 2. Comparison of demographic, occupational and behavioral characteristics of chlamydia-infected with non-infected CSW

	Chlamydia-negative (no.=368)	*Chlamydia-positive (no.=32)*
Mean age	31.54	29.03
Working duration as CSW(mean)	17.16 months	11.05 months
Frequency of commercial sex (mean)	9.24 per week	5.8 per week
Regular use of condom#	26.10% (95/364)	35.48% (11/31)

Regular use of condom is defined as condom use regularly during both commercial sex and sex with regular partner

Table 3. Prevalence of various sexually transmitted diseases in CSW

STDs	*% (no.) of positive results in CSWs*
NSGI	38.8 (155/400)
C. trachomatis	8.0 (32/400)
Gonorrhea	3.5 (14/400)
Genital wart	5.8 (23/400)
Herpes genitalis	1.8 (7/400)
Trichomonas vaginalis	2.8 (11/400)
HIV	0.5 (2/400)
Late syphilis	0.5 (2/400)
Early syphilis*	0.8 (3/400)
Moniliasis	9.3 (37/400)

*Early syphilis includes primary, secondary, and early latent syphilis

Table 4. Presenting symptoms of the chlamydia-positive CSW

Symptoms	*No. (%) of patients*
Asymptomatic	21/32 (65.6)
Discharge (excessive or blood stained)	10/32 (31.3)
Genital pain	2/32 (6.3)
Non-specific or unrelated (pruritus vulva, genital growth, rash)	8/32 (25.0)

Table 5. Analysis of parameter estimates using logistic regression

Parameter	*Chi square*	*P*
Age	3.3202	**0.0684**
Working duration	1.5320	0.2158
Sex frequency	1.7595	0.1847
Condom use	2.3962	0.1216
Gonorrhea	12.8154	**0.0003**

(P<0.1 is statistically significant)

(9/368) of the chlamydial positive and negative groups respectively. The difference was statistically significant (P= 0.0003), implying that there is a strong co-infection rate of genital chlamydial infection in those patients having gonorrhea (Table 5).

DISCUSSION

Chlamydia trachomatis is found to be the most common pathogen in STD for more than two decades. This Gram-negative, coccoid, obligate intracellular bacterium was also identified to be the most prevalent bacteria among the CSW attending our clinic. Immunotypes D through K cause the vast majority of sexually transmitted diseases, and among these the D, E, and F immunotypes are by far the most common.

In this study the prevalence of 8% among prostitutes is unexpectedly much lower than that reported from other regional studies in China. Their prevalence, found by using tissue culture isolation, was 20.8% and 37.6% among prostitutes in Nanjing and Guangzhou respectively.[13,14] The rate detected in this study may be underestimated since Chlamydiazyme has a sensitivity inferior to that of tissue culture. Though the test is technically easier, it has been shown to have fair sensitivity when compared with the gene amplification tests. The lowest sensitivity demonstrated by a study was 56%.[19] It is because sensitivity depends much on the specimen quality that can be affected by the collection technique. The increasing abuse of antibiotics for minor ailments and popularity of self-medication may also 'treat' some infected patients leading to an underestimation of chlamydial infection.

Endocervicitis is the most common presentation of chlamydial infection. As shown in our chlamydia-positive CSW, excessive or blood stained discharge was the most common complaint (31.3%), signaling the presence of endocervical infection. However, apart from endocervicitis, most of them were actually asymptomatic (65.6%). Besides, one-eighth (4/32) of chlamydia culture-positive CSW had no cervicitis clinically. These findings indicate the need of intermittent chlamydial screening for high-risk individuals.

In this study, chlamydial infection was not influenced significantly by working duration, commercial sex frequency or condom use. Reporting errors could happen when answering questions of sensitive issue such as sex frequency. Errors due to memory lapse could also be present when providing information about work duration. The factor of condom use could not be substantiated neither. It might be due to the fact that the interpretation of regular use of condom varied among the subjects and hence confounding the results. On the other hand, for measurable and testable factors such as the co-infection with gonorrhea and age, the association with chlamydial infection could be well documented. Co-infection of C. trachomatis in patients with gonorrhea is always reported to be high (25-50%) in women.[7] In this study, co-infection rate of 35.7% (5/14) was found. In the United States, published studies of screening in sexually active females indicated that age was the most strongly associated socio-demographic factor with chlamydial infection. Prevalence has been highest (>10%) among sexually active, adolescent females. The result of this study can also support the inverse relationship between age and the infection with the highest prevalence below the age of 24.

CONCLUSION

In conclusion, *Chlamydia trachomatis* prevalence was 8% and was the predominant pathogen detected in CSW attending a local Social Hygiene Clinic. Young age and concomitant gonococcal infection were found to be the risk factors. Though the prevalence could be considered as high, it was likely to be underestimated because Chlamydiazyme was rather insensitive comparing with the recently developed gene amplification tests. As a result, some of the subjects in control group were actually false-negative for chlamydial infection, subsequently leading to an incomplete analysis of the various risk factors. Therefore, in future, we look forward to carrying out studies using gene amplification tests for better

evaluation of the prevalence, trend of chlamydial infection and the possible risk factors.

Learning points:
Young age is a risk factor for the acquisition of Chlamydia trachomatis infection. Concurrent infection of gonorrhea with C. trachomatis is common.

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