Original Article

The Prevalence of *Chlamydia trachomatis* Infection in Women Attending Health Clinics in Shiraz, Islamic Republic of Iran

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Abstract

Background: *Chlamydia trachomatis* (CT) is a common cause of sexually transmitted infections (STI) and a prevalent microorganism found in the vaginal discharge of sexually active women. The infection usually has no symptoms; although it may cause chronic complications such as pelvic inflammatory disease (PID), ectopic pregnancy, chronic pelvic pain, tubal infertility and cervical cancer. This study was done, for the first time, in Shiraz (southern Iran) to determine the prevalence of genital C.T in women.

Materials and Methods: A total of 402 women who referred for routine pap smears to randomly selected health centers in Shiraz were tested with the IMAGEN Chlamydia test, a direct immunofluorescence test for the detection of Chlamydia in human urogenital specimens. The results of this test were compared to the socio-demographic condition of each participant as well as their sexually transmitted disease (STD) symptoms, both present and past.

Results: The prevalence rate of Chlamydia infection was 8% (32/402). No correlation was found between this infection and age, marital age, number of children, education and occupational status of the participants. On the other hand, the correlation between the presence of infection and a positive history of STD symptoms, both present and past was significant.

Conclusion: Chlamydia infection is quite frequent in our society, where knowledge about STD infections is scant. Considering the sequelae of this infection and the fact that this is a quiet disease, it seems rational to screen sexually active women and inform them more about this issue.

Keywords: Sexually Transmitted Infection, *Chlamydia trachomatis*, Direct Immunofluorescence, Endocervical Specimen

Introduction

Different microbial agents cause considerable morbidity and mortality worldwide (1). Among these microorganisms, *Chlamydia trachomatis* infection (CTI), an obligate intracellular bacterium with millions of cases annually reported worldwide is the most common cause of bacterial sexually transmitted infections (STI) with the highest incidence in developing countries (2-5). CTI could be transmitted in homosexuals, even amongst women (6). During the last decade, the incidence rate of CTI has increased significantly in Denmark, Norway, the United Kingdom, northern Ireland, Finland, Sweden and eastern Europe. Treatment costs of CTI complications rank second after human immunodeficiency virus (HIV) (7).

Demographic risk factors for Chlamydia infection are young age, unmarried status and lower socioeconomic conditions. Other risk factors are either anatomic (ectopia), behavioral (numbers of sexual partners), microbiologic (concurrent gonorrhea) and hormonal (oral contraception use) (8).

Although 70-80% of women and 50% of men infected with Chlamydia are asymptomatic (2, 4, 9, 10), when left untreated, this infection can lead to complications such as pelvic inflammatory disease (PID), ectopic pregnancy, chronic pelvic pain, tubal scarring, infertility and cervical cancer (3, 4, 7, 8, 11). A result, effective prevention efforts must include screening programs to detect and treat asymptomatic infections (2). These screening tests are designed to detect the disease before clinical symptoms develop and since this infection and its sequelae are common in young women, especially in those aged 15-19, screening, early diagnosis and treatment can improve long-term outcomes (5-9).

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In addition to suggestive signs, symptoms and a presumptive diagnosis; in the case that gonococci are not found, confirmatory tests such as urethral, cervical or rectal cultures, urine or cervical nucleic acid amplification test (NAAT), polymerase chain reaction (PCR), ligase chain reaction (LCR), enzyme-linked immunosorbent assay (ELISA) and the direct immunofluorescent antibody slide tests (DFA) can be performed (12).

Based on the type of screening method and study group, the prevalence rate varies. A review of the articles between 2001 and 2008 shows the prevalence of Chlamydia infection to be between 2% to 8.5% in the normal population who referred for routine tests to health clinics worldwide (2-4).

In Iran, Chlamydia prevalence studies have mainly focused on specific groups such as those with PID, cervicitis, tubal infertility and pregnant women (3, 13-17). In a study in 2007, Firoozjahi and Bakhtiari have shown a prevalence rate of 11.6% for Chlamydia infection among women who attended health care centers in Babol (18).

Population-based studies on the prevalence of CTI in women in Iran are rarely performed, and no studies have been undertaken in the south of Iran. Thus the authors intended to investigate the prevalence of CTI and its risk factors in women in the general population of Shiraz with the intent to use the results for early treatment and prevention of CTI sequelae.

Materials and Methods

This is a cross-sectional study carried out among women of fertility age who attended health care centers affiliated with Shiraz University of Medical Sciences. Based on the Shiraz University of Medical Sciences Ethic Committee rules, appropriate information was given to the patients and those who signed the related forms entered the study. Shiraz (Fars Province, southwestern Iran) was divided into three areas of north, middle and south. One health center was randomly selected from each area. A total of 402 women who referred to these centers for routine pap smears participated in this study.

A standardized questionnaire which included socio-demographic variables of age, marital age, number of children, educational and professional status in addition to a series of questions that asked about any STI symptoms at the time of referral or before, and a previous history of sexually transmitted diseases (STD) was prepared. The midwives who worked in these three centers were educated for correct sampling, sample transport and questionnaire completion.

The IMAGEN Chlamydia test, a direct immunofluorescence test, was used in this study. This test is an available method used for routine screenings, although it is less sensitive than NAAT. This qualitative test detects Chlamydia in human urogenital specimen using a fluorescein-labeled monoclonal antibody through the fluorescein isothiocyanide procedure (FITC).

For cervical sampling, this area was first cleansed to remove excess mucus, blood, and pus. Then, a cotton wool swab was placed approximately 1 cm into the cervical canal. The swab was rotated several times at the squamocolumnar epithelial junction and then withdrawn without touching vaginal surfaces. Then, the swab was rolled on the microscope IMAGEN slide (1) on a specified area. It was air dried at room temperature (15-30°C) and then fixed in fresh acetone for 10 min and air dried again. Slides were immediately carried in a cold box to the laboratory to be frozen and stored at -70°C before staining. Slides were then incubated with the FITC conjugated reagent for 15 min at 37°C in a wet chamber. The excess reagent was removed by washing with PBS (phosphate buffered saline) for 5 min. The stained areas were mounted and viewed with an epifluorescein illuminative microscope.

The positive and negative laboratory results were then compared to the data from the related questionnaires by the chi-square and Fisher's exact tests in SPSS, version 16. The level of significance was considered as $p<0.05$.

Results

The prevalence rate of Chlamydia infection was 8% (32/402) among participants. Table 1 shows age, marital status and child number of the participants. Housewives consisted of 89.6% of the subjects of which 68.6% had guidance school and high school educations, while only 9.7% were university educated. Additional information about their occupational and educational status is presented in table 2.

Table 1: Age, marital age and number of children

	Minimum	Maximum	Mean	Standard Deviation
Age (Year)	17	68	29.96	7.33
Marital age	12	39	19.02	4.07
Number of children	0	9	1.59	1.27

STD was noted in 64.4% of the women (260/402) who indicated a positive history of symptoms in the past. There was a positive correlation between the presence of these symptoms in the past and a positive result of the IMAGEN test (p=0.001).

Table 2: Occupational and educational status of the participants

	Frequency	Percentage
Occupation		
Unemployed	34	8.4
Self-employed	8	2
Housewife	360	89.6
Education		
Illiterate	12	3
Primary school	75	18.7
Guidance school	138	34.3
High school	138	34.3
University degree	39	9.7

Table 3: Past STD symptoms frequency and association with CT infection

Symptoms	Frequency		Positive for CT infection	
	No.	%	No.	%
Dysuria	121	30.1	19	15.7
Itching	168	41.8	21	12.5
Discharge	189	47.01	20	10.58
Ulcer	71	17.66	7	9.86
Herpetic lesion	1	0.25	0	0
Wart	1	0.25	1	100

Table 4: The frequency of current STD symptoms and their association with CT infection

Symptoms	Frequency		Positive for CT infection	
	No.	%	No.	%
Dysuria	53	13.2	8	15.09
Itching	81	20.15	8	9.9
Discharge	159	39.55	22	13.8
Ulcer	79	19.65	11	13.9
Wart	1	0.25	1	100

At the time of referral, 54.48% of the participants (219/402) were symptomatic for STD. There was also a positive correlation between the presence of these current symptoms and a positive Chlamydia test result (p=0.001).

In tables 3 and 4 the frequency of these symptoms in the past and present, and their association with CTI are shown. No significant correlation was found between the participants' age, marital age, number of children, occupational and educational status and the results of Chlamydia test. The frequency of a positive test in correlation to these factors is presented in table 5 (Not all subjects completely answered the questionnaire; therefore the sum of cases is different to the actual subject number in some cases).

Discussion

The prevalence rate of Chlamydia was 8% in this study which was comparable to that of another study in Babol, Iran by Bakhtiari and Firoozjahi which showed a Chlamydia infection rate of 11.6% in women who attended health centers (18).

Similar studies have shown a prevalence rate of 2% to 8.5% (2, 4, 8). However, when comparing the results of different studies, one should consider the difference between the screening test method and lifestyles of the different groups studied. Although the test method of this study is highly specific, we found a lower prevalence rate in comparison to the results of the study by Bakhtiari and Firoozjahi (18). This difference might be due to the low sensitivity of direct fluorescence assay in comparison to the ELISA method used in the other study.

Chlamydia infection prevalence rate has mostly been studied in women presenting with special complications. The prevalence rate has been 12% to 20% in those with cervicitis and 12.5% in those with PID (3,10, 15). The higher prevalence among these groups in comparison with those who attend health clinics for routine checkups is expected as PID and cervicitis are among the sequelae of Chlamydia infections. Other studies on pregnant women have shown the prevalence rate of Chlamydia infection to be 2 to 8% (17-21), which is similar to women without any special health conditions (2, 4, 8).

According to the results of the present study, the highest frequency of positive CT infection was seen in women aged 26-35. CTI declined with increasing age which was statistically significant. Other studies have also shown lower infection rates in older women (4, 8, 18-20). According to "Harrison's Principles of Internal Medicine", the peak incidence of genital C. trachomatis occurs during the late teens and early twenties (12). This age-related occurrence is possibly due to epithelial changes, partial immunity and change in sexual behavior (18). We also expected to see higher rates of Chlamydia infection in women with lower marital ages.

Table 5: The frequency of positive Chlamydia test based on the participants' demographic factors

	Frequency	Positive for CT infection	
Age		**No.**	**%**
<25	122	9	7.38
26-35	196	18	9.18
36-45	70	5	7.14
>45	1	0	0
Marital age			
<20	235	20	8.51
20-25	137	9	6.56
26-35	24	1	4.17
>35	2	0	0
Number of children			
0	63	3	18.75
1-2	270	22	8.15
3-4	55	6	10.91
>5	13	0	0
Occupation			
Unemployed	34	1	2.9
Self-employed	8	1	12.5
Housewife	360	30	8.3
Education			
Illitrate and	87	5	5.7
Primary school			
Guidance school	138	10	7.2
High school	138	13	9.5
University degree	39	3	7.7

Another study revealed that the mean age at first intercourse was not significantly related to the risk of infection (1). Our results have also shown that early marital age, which we considered as the first time of sexual contact, did not increase the infection rate.

In Iran, extramarital sexual relationships are rare, especially among women, so the risk factor of having multiple partners, as shown to be important in other studies (19), has not been included in this study.

The numbers of children in addition to subjects' educational and economic status were considered as determining factors of their socioeconomic condition. Other studies have shown that a poor socioeconomic condition lead to a higher probability of Chlamydia infection (4-18).We found more positive CTI test results among women who had no children, those with high school educations and who were self-employed. No significant differences have been reported in the prevalence of CTI among different occupational groups (7).

Up to 70-80% of women and 50% of men infected with Chlamydia are asymptomatic (2, 4, 9, 10), thus in some patients the presence of CTI is not easily recognized based solely on clinical grounds (8).

In this study, only 45.5% of the cases were asymp-

tomatic. This difference may be due to the presence of co-infections with other microorganisms which were not excluded in our study.

If symptomatic, Chlamydia infected cases are expected to have mostly mild symptoms of discharge, bleeding, lower abdominal pain or dysuria (9). Although most cases of Chlamydia are asymptomatic, it is expected to see this infection more among symptomatic women (8). Vaginal discharge and lower abdominal pain have been the most prevalent accompanying symptoms in Chlamydia positive women as seen in another study done on a group of pregnant women (21). Also, Firoozjahi and Bakhtiari have shown in their study that frequent post-coital bleeding and genital itching are the most common symptoms among infected women (18). In this study, dysuria was the most common symptom. Other prevalent symptoms were vaginal discharge and ulcers. This difference in presenting symptoms among different studies can be due to possible coexisting STI.

Conclusion

It can be concluded that asymptomatic Chlamydia infection among the general population of women is quite frequent in our society, who have scant knowledge about STD. Considering the sequelae of this infection and the fact that this is a quiet disease, it seems rational to screen sexually active women. Such screening might lead to a considerable decrease in the incidence of infertility and PID due to CTI, as some studies have shown (22, 23).

Further studies are recommended with larger sample sizes in order to have screening programs with the intent to promote knowledge about CTI among the general population.

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