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CLINICAL MICROBIOLOGY - RESEARCH PAPER

Chlamydia trachomatis prevalence in females in São Paulo, Brazil: 11 years' surveillance of the infection

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Abstract

Background *Chlamydia trachomatis (CT)* infection is the most prevalent sexually transmitted bacterial disease worldwide whose greatest impact is on the female reproductive system. The objective was to assess the prevalence of *Chlamydia* infection in a large population of female patients from a private health service in São Paulo (Brazil), identifying the main age groups affected by the agent and the evolution of the prevalence.

Methods A cross-sectional study was conducted based on the results of all molecular biology tests. The tests were carried out between January 2005 and December 2015. The positivity of test results was determined by year and age group.

Results A total of 85,292 patients who performed 103,576 tests for *Chlamydia* were considered eligible for the statistical data. The overall prevalence of *C. trachomatis* infection in the study population was 2.2% (95% CI: 2.07–2.25). A higher prevalence of infection was observed in the ≤ 25 years and ≤ 30 years age groups, with rates of 6.0% (95% CI: 5.59–6.35) and 4.4% (95% CI: 4.08–4.50), respectively. There was a significant increase in the positivity of the exams over time, especially in the ≤ 35 years age group. The prevalence at 26–30 years was 3.1% (95% CI: 2.82–3.30); 31–35 years 1.7% (95% CI: 1.50–1.82); 36–40 years 1.0% (95% CI: 0.86–1.16); 41–60 years 0.6% (95% CI: 0.50–0.70) and the prevalence at ≥ 61 years was 0.4% (95% CI: 0.11–0.75).

Conclusion The screening of asymptomatic young women would have the potential to reduce infection, transmission, and sequelae of infection by this agent.

Keywords Prevalence · *Chlamydia trachomatis* · Epidemiology

Abbreviations

CT	*Chlamydia trachomatis*
STD	Sexually transmitted disease
HPV	Human immunodeficiency virus
PID	Pelvic inflammatory disease
CEP	Research Ethics Committee
SPSS	Statistics for Windows software package
PCR	Polymerase chain reaction
IC	Confidence interval
NAATs	Nucleic acid amplification test kits
AIDs	Acquired immune deficiency syndrome

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Background

Chlamydia trachomatis (CT) infection is the most prevalent bacterial sexually transmitted worldwide. The greatest impact of CT infection is on the female reproductive system. Recurrence of infections is common, especially in young women. Successive episodes of infection increase the risk of developing pelvic inflammatory disease and its complications (sequelae), and the risk of infection by the human immunodeficiency virus, human papillomavirus (HPV), as well as other sexually transmitted diseases (STDs) [1].

In sexually active women, the early age of sexual initiation, number of sexual partners, and low adherence to the use of condoms constitute risk factors for CT infection and reinfection [2].

The major obstacle diagnosing CT is the absence of symptoms in around 70–80% of infected women [2].

The most serious complications are salpingitis and acute pelvic inflammatory disease, directly affecting the reproductive life of women [3]. CT infection during pregnancy is associated with a number of different adverse outcomes, including premature delivery, premature amniorrhexis, low birth weight, neonatal death, and post-partum endometritis [3].

Given the serious sequelae caused by CT, programs for screening and early treatment have been implemented in many countries. Currently, the main concern worldwide is screening sexually active young adults to detect and treat asymptomatic infections, thereby reducing the transmission of CT and preventing pelvic inflammatory disease (PID) and its complications [2].

A large CT screening study of the lower genital tract of sexually active, asymptomatic women aged 18–34 years was conducted in the USA to identify and treat those with the infection and to ascertain whether screening was effective for preventing the development of PID. Results of the program showed a 56% reduction in PID rates, suggesting that such interventions are an effective strategy for controlling the disease [4].

Some national programs tend to be based on estimates derived from other countries and regions of the world, largely provided by the World Health Organization. The epidemiological behavior pattern of CT infection in Brazil has not been fully elucidated. Cervicitis and urethritis by this agent are not a notifiable diseases and the majority of public services do not have laboratory tests available in routine clinical practice or epidemiological surveillance. The available data has been drawn from local investigations and studies of specific populations involving small patient samples, predominantly within public health services.

Therefore, the objective of the present study was to assess the prevalence of CT tests in a large cohort of female patients from a private health service, women referred by the gynecologist as routine exams, identifying the main age groups affected by this infectious agent as well as the evolution of the infection over time.

Methods

A cross-sectional study was conducted based on the results of all molecular biology tests to detect CT performed at the SalomãoZoppi Diagnósticos Laboratory (São Paulo, Brazil) between January 2005 and December 2015. The data were obtained from the Data Processing Center of the institution. The laboratory performs tests mainly for female patients in the metropolitan region of the State of São Paulo, where the population has private healthcare plans and a medium socioeconomic level, based on the type of health plan held by the patients.

The following data were collected for each patient: age, date (month and year) of the test, specimen collection site, and the result of the sample. This study was approved by the Research Ethics Committee (CEP) and the need for free informed consent was waived given that the study was retrospective.

Tests performed by both Hybrid Capture and Polymerase Chain Reaction molecular biology techniques were included since these were the only tests available for the retrospective study. The laboratory used the commercial diagnosis kits Digene® Hybrid Capture 2 (CT-ID DNA) and the Cobas® 4800 Test (CT/NG). Tests whose results were inconclusive were excluded and the tests were collected from sites other than urine or the lower genital tract. All repeat tests performed in the same year were excluded, as were retests for exams in patients whose infection-reinfection period was ≤ 6 months.

First, a descriptive analysis of the following data was carried out: number of tests performed for each study year, age of patients assessed (range, mean and standard deviation, and age group strata), and test results (positive or negative). The prevalence was calculated by dividing the number of patients infected (number of new and old cases) during a 1-year period, by the total number of patients analyzed over the same 1-year period, expressed as a percentage.

The prevalence of the agent was then compared for the different study years and age groups using the SPSS– Statistics for Windows software package (version 13.0) and the Chi-squared test, adopting a level of statistical significance of 5% ($p < 0.05$).

Results

A total of 108,449 results of molecular biology tests for detecting *Chlamydia trachomatis* were found for the period from January 2005 to December 2015 in São Paulo City. All female patients, irrespective of age, were included. Of this total, 4873 tests were excluded after applying the exclusion criteria. Thus, a final total of 103,576 eligible tests were performed in 85,292 patients, comprising 84,381 (81.5%) tests done using Polymerase Chain Reaction (PCR) and 19,195 (18.5%) using Hybrid Capture 2. Regarding the sample collection site for detecting the agent, 103,066 (99.5%) were collected from the cervix and 510 (0.5%) from urine.

In the overall sample, 2765 tests for detecting CT were performed at the laboratory in 2005; 3815 tests in 2006; 3267 in 2007; 3464 in 2008; 3941 in 2009; 4822 in 2010; 6637 in 2011; 8411 in 2012; 13,735 in 2013; 21,506 in 2014; while 31,213 tests were done in 2015.

Of the 85,292 patients screened between 2005 and 2015, 72,748 underwent a single test; 9226 were screened twice

in different years; 2104 were screened 3 times; 617 patients 7 times; 42 patients 8 times; 35 patients 9 times; 8 patients 10 times; and 3 patients were tested 11 times.

Regarding the age of patients undergoing the tests, this data was available for 102,866 (99.3%) tests. Age ranged from 14 to 69 years and had a mean of 35.2 ± 9.7 years and a median of 34 years. Patients were stratified by age group as follows: 14,817 (14.3%) women in the ≤ 25 years age group; 20,184 (19.5%) 26–30 years; 23,796 (23.0%) 31–35 years; 17,462 (16.9%) 36–40 years; 24,991 (24.1%) 41–60 years; and 1616 (1.6%) in the ≥ 61 years group. Data on age was missing for 710 (0.7%) tests.

Of the total tests performed, 101,340 (97.8%) proved negative and 2236 (2.2%) positive, thus yielding the overall prevalence of *C. trachomatis* in female patients.

The prevalence of *C. trachomatis,* stratified by study year, is given in Table 1. The prevalence in the population doubled over time, rising from 1.2% in 2005 to 2.5% in 2015 (chi-squared; $p < 0.001$).

The prevalence of CT according to the age group is given in Chart 1. The data show that the infection rate declined significantly with increasing age. The prevalence in the ≤ 25 years age group was 6.0% (95% CI: 5.59–6.35); ≤ 30 years 4.4% (95% CI: 4.08–4.50); 26–30 years 3.1% (95% CI: 2.82–3.30); 31–35 years 1.7% (95% CI: 1.50–1.82); 36–40 years 1.0% (95% CI: 0.86–1.16); 41–60 0.6% (95% CI: 0.50–0.70); and the prevalence in the ≥ 61 years group was 0.4% (95% CI: 0.11–0.75) (chi-squared test; $p < 0.001$).

The prevalence of *C. trachomatis,* stratified by age group and year performed, is given in Table 2. Prevalence rates increased significantly up until 35 years of age. The prevalence in the ≤ 25 years age group increased 3.2-fold in 11 years, rising from 2.2% in 2005 to 7.2% in 2015 (chi-squared; $p < 0.001$). The prevalence of CT in the 26–30 years age group rose by 62.5%, from 2.4% in 2005 to 3.9% in 2015 (chi-squared; $p = 0.029$). In the 31–35 years age group, the

Table 1 Prevalence of *C. trachomatis* stratified by study year

Year performed	Total no. of tests	No. of positive tests	% positive tests
2005	2731	34	1.2%
2006	3763	52	1.4%
2007	3224	43	1.3%
2008	3419	45	1.3%
2009	3876	65	1.6%
2010	4742	80	1.7%
2011	6515	122	1.8%
2012	8243	168	2.0%
2013	13,398	337	2.5%
2014	21,011	495	2.3%
2015	30,418	795	2.5%
Total	101,340	2236	2.2%

Chi-squared test; $p < 0.001$

Chart 1 Prevalence of *C. trachomatis* stratified by age group

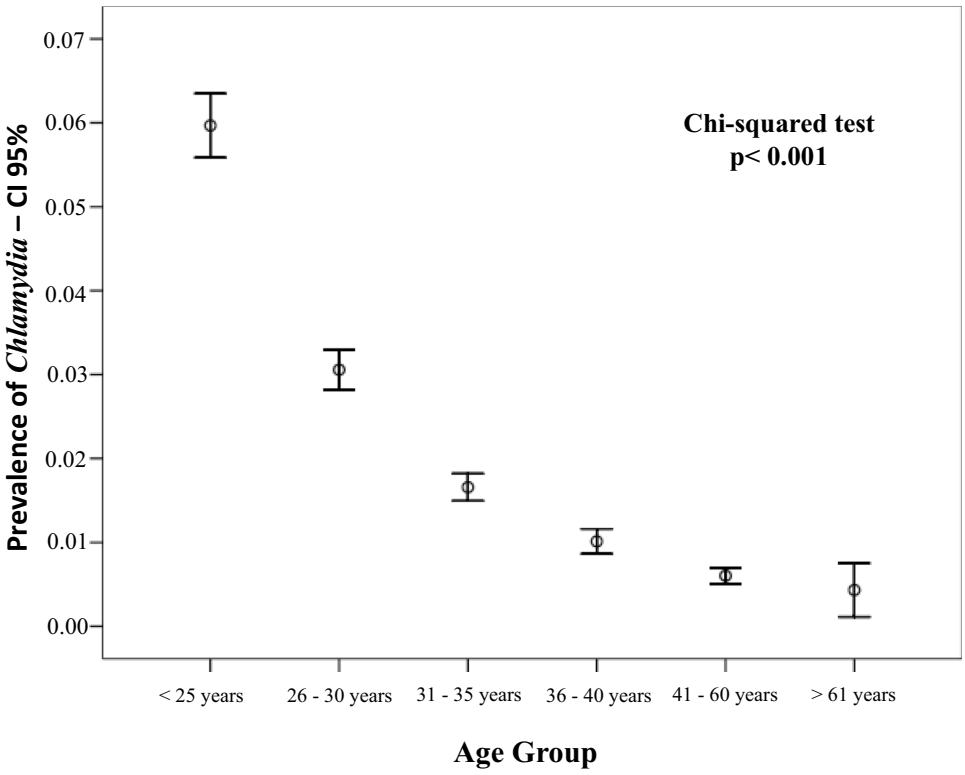

Table 2 Prevalence of *C. trachomatis* stratified by age group and year performed

Year/age group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
≤ 25 years	2.4	3.9	2.6	3.1	4.2	3.2	4.8	6.2	6.0	7.4	7.2
26–30 years	2.4	2.3	3.0	1.8	2.0	2.8	2.6	2.4	3.1	3.1	3.9
31–35 years	0.2	0.2	0.3	1.0	1.3	1.0	1.3	1.3	2.5	1.6	2.2
36–40 years	0.7	0.2	0.6	1.0	1.3	1.1	0.6	0.8	1.1	1.2	1.1
41–60 years	0.7	0.6	0.4	0.4	0.7	0.9	0.7	0.6	0.7	0.5	0.6
≥ 61 years	3.3	4.5	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.3	0.3
Total	1.2	1.4	1.3	1.3	1.7	1.7	1.8	2.5	2.4	2.3	2.6

Chi-squared test; $p < 0.001$

rate increased tenfold in 11 years, from 0.2% to 2.5% (chi-squared; $p < 0.001$).

The overall prevalence of *C. trachomatis* infection in the study population was 2.2% (95% CI: 2.07–2.25). A higher prevalence of infection was found in the ≤ 25 years and ≤ 30 years age groups, with rates of 6.0% (95% CI: 5.59–6.35) and 4.4% (95% CI: 4.08–4.50), respectively.

Discussion

Asymptomatically, CT infection can cause hard-to-manage tubular damage that is often irreparable, limiting the reproductive capacity of women. Besides the reproductive factor, the infection can also lead to chronic pelvic pain and the risk of developing ectopic pregnancies [4].

Strong epidemiological evidence exists suggesting that HPV and CT play a central role in the etiology of cervical intraepithelial neoplasia and consequently in cervical carcinoma. Thus, it has been suggested that cervix malignancy should be included in the complications and costs associated with genital chlamydial infections [5].

Given the high morbidity associated with this agent, large-scale screening programs treating positive cases could avert over half of all acute PID cases and the other complications related to this agent [6]. Clinically, recognition of cervicitis/urethritis/salpingitis due to CT depends on a high level of correct diagnosis on clinical tests, which typically does not occur. Thus, laboratory confirmation of the diagnosis is required for proper treatment and follow-up of patients. Nucleic acid amplification test kits (NAATs) have revolutionized the diagnosis of CT infections, offering higher sensitivity and specificity than other tests, including culture. The NAATs include the Polymerase Chain Reaction (PCR) and DNA detection and signal amplification (Hybrid Capture) [7]. Tests performed in urine and cervical samples were included, given that studies in the literature have shown that the positivity of samples obtained from urine is almost identical to those obtained from samples collected directly from the cervix or urethra [7].

A major strength of the present study is the large number of cases assessed. A total of 103,576 tests in 85,292 patients were assessed over a long period of 11 years. The sample size represents approximately 3.2% of the entire female population aged 14–69 years holding private health plans in São Paulo City.

Of the 103,576 exams executed, they were performed either by the PCR technique or by Hybrid Capture according to the medical request, and the 2 techniques were not performed for analysis of the same sample. In the period from 2005 to 2009, medical requests were predominantly Hybrid Capture as a diagnostic methodology. Since 2010, PCR has become the methodology of choice reported in medical prescriptions in the screening for chlamydia infection.

In Table 3, there is a significant increase in the tests performed by PCR from 2011.

The increase in prevalence from 2012 was not influenced by the replacement of the diagnostic methodology used. Tables 4 and 5 shows that there is an overlap of the confidence intervals (CI 95%) for the prevalence of PCR and Hybrid Capture infection.

One of the strengths of this study is the utilization of the 2 commercially available assays that are frequently used for *C. trachomatis*, the Digene HC2 CT-ID DNA Test (HC2 assay) and Cobas® 4800 (CT/NG) Test (PCR) that are comparable sensitive methods. HC2 assay and PCR have been reported to have high sensitivity and specificity to detect CT. Gridner et al. reported sensitivity and specificity of 95.4 and 99%, respectively for HC2, and 90.8 and 99.6%, respectively for PCR. The sensitivity of CT culture in the same study was 81.5%, which was significantly lower than both HC2 and PCR. Similar test performance was reported from other studies [8–11].

Schachter et al. assessed the effectiveness of retesting an exam with different kit diagnostics. The kits evaluated were Aptima Combo 2 Assay, Amplicor CT / NG, BD Probetec ET (SDA), and CH2. The study demonstrated that some NAATs cannot be used to confirm other NAATs. This led the CDC to revise the 2002 guideline and abolish the use of the retest with another diagnostic kit, suggesting immediate treatment in the case of a positive test [12, 13].

Table 3 Estimates of Chlamydia prevalence in European Union Member States, the USA, and Australia among women aged ≤ 25 years in the general population

Country	Author	*N* patients	Prevalence (%)	95% CI
Australia	Lewis et al. (2012)	121,808	5.0	3.1–6.9
Denmark	ECDC, 2014 (Ostergaard, 1998)	867	5.0	3.61–6.62
Denmark	ECDC,2014 (Andersen/kit, 2002)	21,439	6.5	4.70–8.65
Denmark	EDCD, 2014 (Andersen/postal, 2002)	9000	8.0	5.82–10.64
Slovenia	EDCD, 2014 (Klavs, 2004)	764	4.7	2.50–8.50
France	EDCD, 2014 (Goulet, 2010)	4957	3.6	1.90–6.80
Netherlands	EDCD, 2014 (van den Broek, 2012)[34]	71,129	3.9	2.75–5.05
Norway	EDCD, 2014 (Klovstad, 2012)	10,000	5.8	4.48–7.50
UK	Price et al. (2016)	1971	5.2	3.8–6.9
UK	Adams et al. (2004)	149,430	5.2	4.3–6.3
USA	Torrone et al. (2014); Braxton et al. (2016)	8563	4.7	3.2–6.1

Table 4 Number of exams per year of study stratified by methodology diagnosis

Exam year	Total numbe of PCR exams	Total numbe of hybrid capture exams	Total exams
2005	159	2606	**2765**
2006	536	3279	**3815**
2007	659	2608	**3267**
2008	1126	2338	**3464**
2009	1673	2268	**3941**
2010	2796	2026	**4822**
2011	4539	2098	**6637**
2012	7695	716	**8411**
2013	13,133	602	**13,735**
2014	21,078	428	**21,506**
2015	30,987	226	**31,213**
Total	84,381	19,195	**103,576**

Chi-squared test; $p < 0.02$

The overall prevalence of *C. trachomatis* infection in the study population was 2.2%. A higher prevalence of infection was observed in the ≤ 25 years and ≤ 30 years age groups, with rates of 6.0% and 4.4%, respectively. There was a significant increase in the positivity of the exams over time, especially in the ≤ 35 years age group. These young patients generally switch partners more frequently and after a short period stop using condoms, becoming exposed to the agent, thus leading to a higher prevalence of the agent in this age group. Besides these factors, the young women in this age group tend to only seek medical services when symptoms emerge [7].

The literature confirms that the prevalence of chlamydial infection depends on the characteristics of the population studied, with age group, high-risk groups, and socioeconomic level exerting a strong influence. Most studies conducted globally and in Brazil involve specific populations and include a small number of patients (under 500 women per study), creating a risk of bias when extrapolating data in prevalence studies.

Brazil has no CT screening program and many studies using highly sensitive diagnostic tests based on nucleic amplification technology have revealed a high prevalence of CT infections of 5.0–31% among young users of outpatient and gynecology clinics participating in a government Family Health Program [14].

Table 5 Prevalence of Chlamydia by year of study, stratified by diagnostic methodology

Exam year	Prevalence of Chlamydia by PCR	Confidence interval 95%	Prevalence of Chlamydia by hybrid capture	Confidence interval 95%
2005	2.5%	0.08–4.95	1.2%	0.74–1.56
2006	1.5%	0.47–2.52	1.3%	0.95–1.74
2007	0.8%	0.10–1.42	1.5%	1.00–1.92
2008	1.3%	0.66–2.00	1.3%	0.83–1.74
2009	1.6%	0.96–2.15	1.7%	1.18–2.25
2010	2.0%	1.48–2.52	1.2%	0.71–1.66
2011	2.0%	1.60–2.41	1.5%	0.96–1.99
2012	2.0%	1.72–2.36	1.5%	0.64–2.44
2013	2.5%	2.20–2.73	2.2%	1.00–3.32
2014	2.3%	2.08–2.48	3.5%	1.76–5.25
2015	2.5%	2.37–2.72	2.2%	0.29–4.13

Brasiliense et al. determined the prevalence of CT in all ages of 154 women treated at a public hospital in the Brazilian city of Belém, the capital of the state of Pará. The authors observed that the overall prevalence of CT infection was 11%, with the highest prevalence of 20.4% observed in women between 16 and 20 years of age [15].

In other countries, prevalence varies according to the population studied. Gaydos et al. [16] reported results of a study involving 13,204 female American army recruits, showing a prevalence of CT infection of 9.2%, with the highest positivity found in the 17–25 age group. The positivity rate in the control population of adolescent girls and women aged 12–39 years was 4.5%. CT prevalence among 1028 sexually experienced young women and men aged 15–20 years in Norway was assessed. The authors found that the women had double the prevalence of CT of men (7.3% vs 3.9%) [17].

In a systematic review, 25 studies from different countries were analyzed. The prevalence of urogenital CT was 1.1–10.6% in women and 0.1–12.1% in men. The mean prevalence of infection proved highly variable across countries and was higher in women than in men, with younger age groups (< 25 years) having the highest rates. The absence of symptoms of the infection was common in both men and women (mean of 88.5% vs 68.3%) [18].

In a meta-analysis study carried out by Lewis et al. in Australia, 76 studies met the inclusion criteria for the review. A high level of heterogeneity among the studies was found. In community or general medical settings, the pooled prevalence for women < 25 years of age in the studies conducted after 2005 was 5.0% (95% CI: 3.1, 6.9; five studies), whereas the prevalence for men < 30 years over the analysis period as a whole was 3.9% (95% CI: 2.7, 5.1; six studies). The estimated CT prevalence among young Australians aged < 25 years frequenting sexual health and family planning clinics was 6.2% (95% CI: 5.1, 7.4; 10 studies) for women and 10.2% (95% CI: 9.5, 10.9; five studies) for men. The prevalence was 22.1% (95% CI: 19.0, 25.3; three studies) among indigenous women aged < 25 years and 14.6% (95% CI: 11.5, 17.8; three studies) among indigenous men < 25 years [19].

In another systematic review and meta-analysis on CT prevalence in women conducted in the UK, the most influential variables on prevalence rates were age and the profile of the population tested. Within general clinics, the < 20 years age group had an estimated prevalence of 8.1% (95% CI 6.5–9.9), 20–24 years 5.2% (95% CI 4.3–6.3), 25–29 years 2.6% (95% CI 2.0–3.3), decreasing to 1.4% (95% CI 1.0–1.9) in individuals aged > 30 years. Overall, studies in health services reported higher prevalence rates than population-based studies. Among young adults aged < 20 years, estimates were 17.3% (95% CI 13.6–21.8) in genitourinary medicine clinics, 12.6% (95% CI 6.4–23.2) in pre-natal clinics, 12.3% (95% CI 9.8–15.3) in abortion clinics; 10.7% (95% CI 8.3–13.8) in clinics for young adults; 10.0% (95% CI 8.7–11.5) in family planning clinics and 8.1% (95% CI 6.5–9.9) in general clinics, versus 5.0% (95% CI 3.2–7.6) in population-based studies [20].

The CT prevalence found in the present study among women aged ≤ 25 years was 6.0% (95% CI: 5.59–6.35), a similar rate to that reported in some high-income countries such as the UK, Australia, the USA, Denmark, France, Norway, and Slovenia, as shown in Table 5. However, the present study revealed in the general population a higher rate than the 4.3% (95% CI: 3.6–5.0) estimated by a meta-analysis of population-based surveys in 25 high-income countries for women aged ≤ 26 years in the general population [21].

Previous systematic reviews have included studies done in health care settings, the results of which cannot be easily extrapolated to the general population because they include people with symptoms and exposures that put them at higher-than-average risk of chlamydia infection [21].

The patients assessed in the present study sample generally underwent regular tests with diagnosis and treatment of the agent, thereby reducing the prevalence of the infection. Nevertheless, a significant increase in test positivity was noted over time, showing that, despite broad disclosure about the risks of CT infection and its prevention and treatment, the women continued to expose themselves to high-risk sexual activity. Besides these factors, other possible explanations include increased screening coverage (for example, the total of exams increased from 2765 to over 31,213 in 11 years). An increase in the prevalence of CT over time was also observed by Somayaji et al. (Canada) [22], Nielsen et al. (Sweden) [23], and Owings et al. (USA) [24].

A recent study provided the updated prevalence of CT among general population worldwide, which covered 24 countries from 5 WHO regions. The prevalence of CT infection for women ranged from 0.2 to 12.2% for the 26 studies. The pooled prevalence of CT infection for women was 3.1% (95% CI, 2.5–3.8%). Based on the results, the general population from Latin America, especially females, and women in Africa should be given priority by WHO when designing and delivering CT control programs [25].

Although the prevalence of the disease is greater in younger populations, requests for infection screening are highest among women aged over 30 years. This is because screening is ordered in an opportunistic manner during routine gynecological exams. Women are becoming pregnant later in life, and those over 30 years of age may have previously had episodes of CT infection, where preventing further infection episodes is fundamental to reduce the risk of infertility.

Studies have shown that CT screening, when carried out under a public health program, has excellent

cost-effectiveness. The best cost-effectiveness is achieved when CT screening is done annually with an emphasis on the younger population. CT prevalence in countries running annual screening programs that require heavy investment is the same as the rates obtained in the present study. However, in most of these countries, screening is performed using home kits, facilitating adherence to the study of the infection. The opportunistic screening strategy performed during routine gynecological exams allows health professionals to assess the at-risk population eligible for the exam, albeit young women or adults, with a focus on reducing the risk of pelvic inflammatory disease and cervical cancer. Thus, prevalence studies in large populations are required to ascertain the best strategy for controlling the infection.

There are also several limitations to this study. First, as a retrospective study, it was not possible to apply a behavioral questionnaire to assess the prevalence of subgroups at higher risk of infection. Second, patients may have lost their health insurance during the 11-year study period and may have lost access to routine gynecological examinations, limiting the evaluation of recurrent infections. Third, the prevalence of infection in this population may be different from that of women without access to gynecological exams.

The patients in the present study held private healthcare plans and had ready access to medical resources. This profile may explain the lower positivity of CT tests (2.2%) found in the present sample relative to rates reported in the literature.

In Brazil, educational campaigns promoted by the federal, state, and municipal bodies responsible for public health are focused on AIDs prevention. However, raising awareness of other STDs such as CT receives scant investment, leading to a lack of knowledge by the population about the infection. This may be a reason explaining the rise in the incidence of STDs over the past 11 years, especially among adolescents and young adults. Factors such as changes in sexual behavior and child-juvenile prostitution call for rigorous screening of the infection in the younger population and for investment to raise awareness about the disease.

Conclusion

In conclusion, the results of the present study showing high positivity in CT tests of patients screened opportunistically highlight the need to plan national programs for diagnosing genitourinary tract infections by CT. In addition, these results underscore the importance of screening strategies, particularly for asymptomatic individuals, and of treating those infected (including sexual partners) in a bid to control STDs and their complications, thereby preserving women's fertility and reproductive health.

Declarations

Conflict of interest The authors declare no competing interests.

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