Preliminary results of a screening programme for Chlamydia in an asymptomatic young population

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Abstract

Introduction Chlamydia trachomatis infection has increased in recent years, reaching 127 million cases in 2016. Possible complications, especially among women, require intervention for early detection. The objective of our study was to determine the prevalence of Chlamydia infection in a young, sexually active, asymptomatic population.

Methods A cross-sectional study was conducted among young patients aged 18 to 25 years attending the emergency room for any reason. The presence of Chlamydia trachomatis and other STIs in urine was determined.

Results Twenty-two patients enrolled in the screening (7.4%) were diagnosed with Chlamydia. A further nine patients among the partners of those affected were detected. Young people with two or more sexual partners in the last month and those suffering from infection by ureaplasma were at greater risk of infection by Chlamydia. Up to 50% of participants do not use barrier methods

Conclusion The prevalence of infection by Chlamydia in the asymptomatic young population is higher than expected. The scarce use of barrier methods among this population may be one of the causes of this increase and one of the targets to work on in order to reduce the prevalence of the infection.

Introduction

The natural history of Chlamydia infection is unknown. The period of communicability can reach several months in subjects who are not treated. In 70% of women and 50% of men the infection can be asymptomatic. If left untreated, the infection can persist for months and can produce important long-term sequelae. Genital infection in women can result in pelvic inflammatory disease (PID), which carries a risk of infertility or ectopic pregnancy, notwithstanding complications in pregnancy and postpartum. It can also cause infertility in the male population.

Infection by *Chlamydia trachomatis* has become an emerging sexually transmitted disease globally. According to estimates by the WHO in 2016, 127 million people worldwide had been infected with chlamydia. In countries with higher gross domestic product, Chlamydia infection is the most common among young heterosexuals. In 2017, Unemo M *et al.* stated that Chlamydia infection was the most common bacterial STI and that it causes reproductive complications, especially in women. The same review recommends the performance of opportunistic screening in asymptomatic patients or in patients with risk factors for infection. However, the study by Hocking *et al.* did not reveal the expected results in a population screening programme.

Due to the lack of scientific evidence on what are the best initiatives to control Chlamydia infection, the WHO strategy in STI 2016–2021 recommended investigating the cost effectiveness of screening projects. Some countries such as Australia, the United States and Canada have conducted screening programmes.

However, none of these cases establish the recommendation to screen based on a specific prevalence of the infection. Projects in Europe have increased in recent years.

Other screening programmes have been conducted in asymptomatic patients such as the one carried out in Bangkok in a homosexual population, and in Paris in patients attending a specific STI centre, where the prevalence was 5.7%.

In Spain, surveillance is carried out via the Microbiological Information System. In Catalonia, however, it is reported individually to the surveillance system. And it is precisely in Catalonia that, according to data from the CEEISAT, there has been an increase from the 300 plus cases a year in 2008 to more than 900 cases per year in 2014. Between November 2012 and April 2013 in the STI Unit of the Arnau de Vilanova University Hospital a pilot study was conducted in patients attending for a sexually transmitted infection (STI) yielding a prevalence of infection by Chlamydia of 10%, which was higher than expected.

The involvement of the Emergency Services in the control of Chlamydia infection has been discussed in other initiatives. Currently in our country, rapid detection tests for Chlamydia such as those described by Gaydos are not used. In 2018, [Adamson *et al.*](#) presented the results of the screening programme for Chlamydia infection in Australia where emergency services were involved. We believe that carrying out the screening program in an emergency department allows us to access a healthy young population group that is difficult to get in touch with the public health system.

The aim of our study was to detect the prevalence of Chlamydia infection in asymptomatic, sexually active young patients attending the emergency room for reasons unrelated to an STI.

Methodology

An epidemiological cross-sectional study was conducted on the prevalence of Chlamydia infection detected in a screening programme for patients who attended the emergency room between 1 December 2017 and 31 December 2018. The Emergency Department of the Arnau de Vilanova University Hospital is the reference centre for about 300,000 patients in our health region. Of these, about 7,000 patients are between 18 and 25 years old.

Variables

All patients who agreed to participate in the study were informed of the study protocol and were interviewed with questions based on the CEEISCAT epidemiological survey. Subjects' sociodemographic (age, sex, country of origin, level of education and employment status) and epidemiological variables (sexual orientation, number of sexual partners in the last month and year, use of barrier methods and practice of prostitution), and medical history (previous diagnosis of STIs in the last year and pregnancy) were evaluated. In addition to the detection of Chlamydia infection, the same sample was used to detect

Ureaplasma urealyticum, *Ureoplasma parvum*, *Mycoplasma genitalium*, *Mycoplasma hominis*, *Trichomonas vaginalis* and *Neisseria gonorrhoeae*.

The method applied for the diagnosis of Chlamydia infection was the Nucleic Acid Amplification Test (NAAT) [Allplex™ STI Essential Assay](#), Seegne® in urine for men and women, with 88–95% sensitivity and 95–98% specificity.

Patients with Chlamydia were summoned to the STI Unit at the Arnau de Vilanova University Hospital, where they were administered treatment for the detected infection, the contact study was carried out and the opportunity to perform serology to detect other sexually transmitted diseases (HIV, Hepatitis B and C and Syphilis) was offered.

Inclusion criteria

Sexually active patients between 18 and 25 years of age attending the Emergency room between the dates set out above for reasons not related to a sexually transmitted infection were included. We considered a sexually active person, the one who had had sex in the last 6 months.

Exclusion criteria

Patients who did not agree to participate or who had symptoms that could be caused by Chlamydia were excluded.

Statistical analysis

Qualitative variables were described by absolute frequencies and percentages. For quantitative variables, the median and 25% and 75% percentiles were obtained. The prevalence of Chlamydia infection and other STI were estimated and the 95% confidence interval (CI) was calculated. Possible differences in the population were evaluated according to whether Chlamydia was detected or not. Whenever application assumptions were held, the Pearson's Chi-square test was used to compare the qualitative variables, and the Mann-Whitney test was used for the quantitative variables. The crude odds ratios (OR) calculated by the Wald method and their 95% CI calculated using normal approximation were also obtained.

A logistic regression model was developed to determine the variables associated with Chlamydia infection. Forward selection approach based on the likelihood ratio test was followed to determine the independent variables of the multivariable analysis. Age and sex were included as adjustment variables. Calibration was evaluated using the Hosmer-Lemeshow test, and discrimination with the area under the ROC curve. The adjusted OR are presented, along with the 95% CI. In all analyses an alpha error of 5% was assumed and the R statistical program was used.

Results

During the study period, 7267 patients between 18 and 25 years old went to the emergency room. Of these, 3775 (51.9%) attended a clinic that could be caused by an infection by *Chlamydia* (abdominal pain, dysuria or genital secretion). 2182 patients denied being sexually active (30%). Of the 1310 patients who were likely to participate in the study, 300 (22.9%) agreed to participate. We studied 300 patients, but two were excluded as they were under 18 years of age, 54.4% were women and the median age was 22 years. The sociodemographic variables are presented in Table 1. Ninety-three percent of participants declared themselves as being heterosexual, 4.4% bisexual, and the remaining 2.3% homosexual. Just over one-tenth (10.4%) had two or more partners in the last month, 49.3% had not used a condom in their last sexual intercourse, and 4.4% reported a previous STI. (Table 2).

In the screening study, 22 *Chlamydia*-infected patients were detected (7.4%, 95% CI = 4.8–11.1%), and a further nine were detected in the study of their contacts. The total number of patients infected with *Chlamydia* was 31.

An STI was diagnosed in 34 patients (11.4%). In addition to the 22 infected with *Chlamydia trachomatis*, 11 were infected with *Ureaplasma urealyticum* (3.7%), 2 with *Mycoplasma genitalium* (0.6%), 1 with *Trichomonas vaginalis* (0.3%), and 1 with *Neisseria gonorrhoeae* (0.3%). Three patients were co-infected with *Chlamydia* and *Ureaplasma*. Only in three patients was serologic screening carried out for hepatitis B, C, syphilis and HIV. HIV was detected in one of these cases.

Chlamydia infection showed no association with age or gender, but manual workers (17.4%), service workers (17.4%) and the unemployed (13.3%) had a higher prevalence of infection than students (3.9%). Patients with secondary school studies also had a higher prevalence of *Chlamydia* than the other groups (Table 3). All subjects in whom *Chlamydia* infection was detected were heterosexual, and 60% had a stable partner. Patients with *Chlamydia* had a greater number of sexual partners. Approximately 40% of the study participants did not use barrier methods routinely (Table 4).

Twenty-one patients with *Chlamydia* received treatment (95.5%). Focusing on the other STIs, only four patients were treated for *Ureaplasma* and one for *Neisseria*. Twelve of the patients with *Chlamydia* identified their contact (54.5%) and nine of them were diagnosed and treated for *Chlamydia*.

Logistic regression analysis showed that patients who had two or more partners in the last month (OR, 3.8; 95% CI (1.2–12.1) and were infected with *Ureaplasma* (OR 6.8; 95% CI (1.6–29.2) had a higher risk of *Chlamydia* infection (Table 5)

Discussion

The prevalence of *Chlamydia trachomatis* infection in young asymptomatic patients is 7.4% in the screening patients, and 10% if we add the patients that were detected in the study of contacts. This figure

is higher than that previously described in our environment, since prevalence had been estimated at 5%. In 2010 a similar study was conducted in our country that showed a prevalence of 4%.

This is the first screening study for infection by *Chlamydia trachomatis* in young asymptomatic subjects in Catalonia. The study results are preliminary, although we have considered that they are relevant enough to be communicated. At the moment the screening program is still underway in our Emergency Department, and we believe that if the high prevalence is confirmed, we can consider carrying out this screening program in other UR services in our region. We believe that the population attending out-of-hours healthcare services was a good choice since it is difficult to contact young patients since they tend to visit the emergency room for acute problems or accidents. Previous studies to screen for the infection have been conducted, but in risk groups or subjects who attend STI units.

The mean age of our sample is 22 years and there is a predominance of women (54.5%). However, there is no association with gender, age, sexual orientation or country of origin. However the low number of patients classified as homosexual and/or bisexual could account for the absence of a significant relationship.

There is an association with the number of sexual partners in the last month: the greater the number of sexual partners in the last month, the higher the risk of Chlamydia infection. This was already described by Lopez-de-Munain in a recent study²⁶ which also revealed a higher risk of infection in a cohort of patients who attended an STI unit and reported two or more sexual partners in the last month.

The study allowed us to detect 31 cases of Chlamydia in asymptomatic patients, thus preventing the spread of the disease and the subsequent complications that may arise from asymptomatic infection. Also, in the subsequent study, we detected one case of HIV in an asymptomatic patient. Probably, if serology had been performed in a larger number of patients, we would have detected more cases. It was disappointing that many patients have not undergone serological tests despite their positive results for other STIs. Patients are probably not aware of the high likelihood of being infected by other sexually transmitted infections, in addition to Chlamydia.

The co-infection of Chlamydia with *Ureaplasma parvum* is notable. This association is also described in other studies. (Kim SI) (Berçot) and (Yamazaki) suggest that the presence of Ureaplasma has a significant effect on the presence of *C. trachomatis* in the genital tract (Yamazaki²⁵). Berçot *et al.* go further and relate this co-infection with the establishment of chronic *C. trachomatis* infection. We believe the possibility of using tests that detect various infections in screening programmes may be in order to achieve greater patient information, although there is a need to perform cost-benefit studies and discard overdiagnosis and overtreatment before recommending their use.

One study (Miranda) showed that even in asymptomatic women there is a high incidence of STIs whether they belong to a high-risk group or not, as our results confirm. This article also suggests that both asymptomatic and symptomatic patients should be screened for STIs.

We also believe it is relevant that approximately 50% of participants do not use barrier methods regularly and did not use a condom at their last sexual intercourse. This is remarkable given the multitude of awareness campaigns that exist and the little impact they have on young people. Strategies to promote condom use and improve its impact on young people should be reviewed.

To date, screening programmes had been conducted in patients with risk factors to make them more cost effective. Through an opportunistic case finding strategy, the project took advantage of visits by young sexually active patients to an emergency room to reach one of the main risk groups which, being asymptomatic, is very unlikely to attend the physician's office.

We believe that having detected 7.4% of infected young people highlights the significant increase in the prevalence of Chlamydia infection since 2010 (16) and justifies the planning of strategies to detect infection in young patients. The benefit of receiving treatment and avoiding complications and sequelae is sufficiently important to consider implementing a nationwide strategy.

The main limitation of our study is the current sample size. We have achieved a response of 23% of the participants so that the size of our sample is small. However, the screening program continues. Moreover, another limitation is that in the emergency room younger patients are sometimes accompanied by relatives and in their presence, these patients do not admit the practice of sexual relations. Furthermore, many patients refused the chance to expand the serological study. Information on some significant variables such as sexual orientation, condom use and number of partners may be subject to some errors due to the stigma attached to STIs. Also, the out-of-hours healthcare services user population may not be representative of all young people.

Our study provides evidence of the importance of a screening programme, but also the importance of campaigns to raise awareness in the use of barrier methods, since the number of sexual partners is still the main factor conditioning Chlamydia infection.

Declarations

- Ethical approval: The study (CEIC–1844) was approved by the Ethics Committee of the Lleida Biomedical Research Institute. All patients signed a form of informed consent for their inclusion in the study and patient data were processed according to Organic Law 3/2018 on Data Protection.
- Competing interests: The authors declare no conflict of interest.
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- Author's contributions: OY and PG contribute to the conception and design of the work. JMF, RL and AV participated in the acquisition and interpretation of data. JA drafted the work and revised it critically. All the authors gave the final approval of the version to be published.
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Tables

Table 1 Sample sociodemographic variables

		N (%)
		298 (100%)
Sex		
Male		136 (45.6%)
Female		162 (54.4%)
Mean Age (P25-P75)		22 [20-23.08]
Employment		
Craftspeople and skilled workers in the manufacturing and construction industries (except operators of plant and machinery)		23 (7.72%)
Accounting, administrative and other office employees		12 (4.03%)
Student		154 (51.7%)
Elementary occupations		8 (2.68%)
Other technical, scientific and intellectual professionals		7 (2.35%)
Unemployed		30 (10.1%)
Technical, scientific and intellectual professionals		16 (5.37%)
Qualified agricultural, livestock, forestry and fisheries employees		25 (8.39%)
Workers in catering, personal, security and sales services		23 (7.72%)
Country of Origin		
Spain		214 (71.8%)
Rest of Europe		27 (9.06%)
Africa		25 (8.39%)
Asia		2 (0.67%)
South America		30 (10.1%)
Education Level		
No Education		6 (2.01%)
Primary		19 (6.38%)
Vocational Training		76 (25.5%)
Secondary		82

University	(27.5%) 115 (38.6%)
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Description of the sample included in the study.

Table 2

Sample clinical and epidemiological variables

	N (%)
	298 (100%)
Sexual Orientation	
Heterosexual	277 (93.0%)
Homosexual	7 (2.35%)
Bisexual	13 (4.36%)
Unknown	1 (0.34%)
Stable Partner	
No	117 (39.3%)
Yes	181 (60.7%)
Number of partners in the last month	
0-1	267 (89.6%)
2+	31 (10.4%)
Number of partners in the last year	
1	188 (63.1%)
2-5	84 (28.2%)
6+	26 (8.72%)
Exercising Prostitution	
No	295 (99.0%)
Yes	3 (1.01%)
Routine Use of Barrier Methods	
No	124 (41.6%)
Yes	174 (58.4%)
Condom use at last intercourse	
No	147 (49.3%)
Yes	151 (50.7%)
Pregnancy	
No	291 (97.7%)
Yes	7 (2.35%)
Previous STI diagnosis?	
No	285 (95.6%)
Yes	13 (4.36%)
Within the last year	
No	297 (99.7%)
Yes	1 (0.34%)

Clinical and epidemiological characteristics of the patients participating in the study.

Table 3. Patient demographic variables according to Chlamydia infection

	Yes (N=22)	No (N=276)	P Value	OR (95% CI)
Sex			0.81	
Male	9 (40.9%)	127 (46.0%)		Ref
Female	13 (59.1%)	149 (54.0%)		1.23 [0.51;2.97]
Age			0.752	
	22.0 [21.0;23.0]	22.0 [20.0;24.0]		1.03 [0.85;1.26]
Employment			-	
Craftspeople and skilled workers in the manufacturing and construction industries (except operators of plant and machinery)	4 (18.2%)	19 (6.88%)		
Accounting, administrative and other office employees	1 (4.55%)	11 (3.99%)		
Student	6 (27.3%)	148 (53.6%)		
Elementary occupations	0 (0.00%)	8 (2.90%)		
Other technical, scientific and intellectual professionals	1 (4.55%)	6 (2.17%)		
Unemployed	4 (18.2%)	26 (9.42%)		
Technical, scientific and intellectual professionals	2 (9.09%)	14 (5.07%)		
Qualified agricultural, livestock, forestry and fisheries employees	0 (0.00%)	25 (9.06%)		
Workers in catering, personal, security and sales services	4 (18.2%)	19 (6.88%)		
Country of Origin			-	
Spain	17 (77.3%)	197 (71.4%)		
Europe	0 (0.00%)	27 (9.78%)		
Africa	2 (9.09%)	23 (8.33%)		
Asia	1 (4.55%)	1 (0.36%)		
South America	2 (9.09%)	28 (10.1%)		
Education Level			-	
No Education	1 (4.55%)	5 (1.81%)		Ref
Primary	1 (4.55%)	18 (6.52%)		0.28 [0.01;5.27]
Vocational Training	7 (31.8%)	69 (25.0%)		0.51 [0.05;4.98]
Secondary	8 (36.4%)	74 (26.8%)		0.54

				[0.06;5.22]
University	5 (22.7%)	110 (39.9%)		0.23 [0.02;2.33]
Chi square test for sex, and Mann-Whitney test for age. OR obtained univariate logistic regression				

Table 4. Epidemiological and clinical variables of patients infected by Chlamydia

	Yes (N=22)	No (N=276)	P Value	OR (95% CI)
Sexual Orientation			-	
Heterosexual	22 (100%)	255 (92.4%)		
Homosexual	0 (0.00%)	7 (2.54%)		
Bisexual	0 (0.00%)	13 (4.71%)		
Unknown	0 (0.00%)	1 (0.36%)		
Stable Partner			>0.999	
No	9 (40.9%)	108 (39.1%)		Ref
Yes	13 (59.1%)	168 (60.9%)		0.93 [0.38-3.25]
Number of partners in the last month			0.064	
0-1	17 (77.3%)	250 (90.6%)		Ref
2+	5 (22.7%)	26 (9.42%)		2.83 [0.96-8.29]
Number of partners in the last year			0.326	
1	11 (50.0%)	177 (64.1%)		Ref
2-5	8 (36.4%)	76 (27.5%)		1.69 [0.66;4.38]
6+	3 (13.6%)	23 (8.33%)		2.10 [0.54;8.08]
Exercising Prostitution			-	
No	22 (100%)	273 (98.9%)		
Yes	0 (0.00%)	3 (1.09%)		
Routine Use of Barrier Methods			>0.999	
No	9 (40.9%)	115 (41.7%)		Ref
Yes	13 (59.1%)	161 (58.3%)		1.03 [0.43-2.49]
Condom use at last intercourse			0.465	
No	13 (59.1%)	134 (48.6%)		Ref
Yes	9 (40.9%)	142 (51.4%)		0.65 [0.27-1.58]
Pregnancy			-	
No	21 (95.5%)	270 (97.8%)		
Yes	1 (4.55%)	6 (2.17%)		
Previous STI diagnosis?			-	
No	20 (90.9%)	265 (96.0%)		
Yes	2 (9.09%)	11 (3.99%)		
Within the last year			-	
No	22 (100%)	275 (99.6%)		
Yes	0 (0.00%)	1 (0.36%)		
P values correspond to the chi-square test.				
OR obtained univariate logistic regression				

Table 5. Multivariate logistic regression analysis for Chlamydia infection.

	OR	(95% CI)	P-value
Number of partners in the last month (2+ vs <2)	3.84	1.22- 12.1	0.021
Ureaplasma Infection	6.81	1.59- 29.2	0.010
Age	1.02	0.83- 1.26	0.831
Sex =Female	1.62	0.62-4.20	0.324

Analysis adjusted for sex and age.

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