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Original article

## Clinical and epidemiological characteristics of *Chlamydia trachomatis* infection among sexually transmitted infection clinics patients<sup>☆</sup>



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### ABSTRACT

**Background:** *Chlamydia trachomatis* (CT) infections are a public health problem because of its high incidence and consequences on reproductive health. Our aim is to describe the socio-demographic, behavioral and clinical characteristics of patients with CT infection in order to adapt preventive interventions to the highest risk groups.

**Methods:** Prospective case series of all patients diagnosed with CT between September 2016 and January 2019 in the reference STI clinics of Osakidetza (Basque Health Service) in Bizkaia (Spain).

**Results:** 847 patients (88.2%) agreed to participate: 41% women, 33.8% heterosexual men and 25% men who has sex with men (MSM); 33% were immigrants and 26% were under the age of 25 (33% of the women). Only 20% systematically used condoms. 36% had previously had STI and 28% had simultaneously another STI. 55% of the infections were asymptomatic (70% among women). In MSM, the rectum was affected in 69.5% of cases, the urethra in 31.4%, and the pharynx in 14.5%. The cervix was affected in 86.5% of the women, the rectum in 17.6%, and the pharynx in 13.8%. A contact study was only carried out in 58% of cases. The reinfection rate at 4 weeks was 17% among those with criteria to perform a test of cure.

**Conclusion:** Our results justify implement opportunistic screening in women under the age of 25 and young immigrants of both sexes, by taking genital and extragenital samples, as well as developing appropriate guidelines for the notification and follow-up of contacts.

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### Características clínicas y epidemiológicas de la infección por *Chlamydia trachomatis* en pacientes de consultas de infecciones de transmisión sexual

#### R E S U M E N

**Introducción:** Las infecciones por *Chlamydia trachomatis* (CT) son un problema de salud pública por su alta incidencia y consecuencias sobre la salud reproductiva. Nuestro objetivo es describir las características sociodemográficas, conductuales y clínicas de los pacientes con infección por CT para adaptar las intervenciones preventivas a los grupos con mayor riesgo.

#### Palabras clave:

*Chlamydia trachomatis*

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**Métodos:** Serie de casos prospectiva de todos los pacientes diagnosticados de CT entre septiembre 2016-enero 2019 en las consultas de referencia para infecciones de transmisión sexual (ITS) de Osakidetza en Bizkaia.

**Resultados:** Aceptaron participar 847 pacientes (88,2%): 41% mujeres, 33,8% varones heterosexuales y 25% hombres que tenían sexo con hombres (HSH); 33% eran inmigrantes y 26% menores de 25 años (33% entre las mujeres). Utilizaban siempre preservativo un 20%. Un 36% habían tenido ITS anteriormente y 28% tenían otra ITS simultánea. El 55% de las infecciones fueron asintomáticas (70% entre las mujeres). El recto fue la localización más frecuente entre los HSH (69,5%), seguida de la uretra (31,4%) y faringe (14,5%). En las mujeres, la infección afectó principalmente el cérvix (86,5% de los casos), seguido del recto (17,6%) y faringe (13,8%). Se estudió a los contactos del 58% de los pacientes. La tasa de reinfección a las 4 semanas fue del 17% entre aquellos con criterios para realizar un test de cura.

**Conclusión:** Estos resultados justifican la implantación de cribados oportunistas en mujeres menores de 25 años e inmigrantes jóvenes de ambos sexos, con toma de muestras genitales y extra-genitales, y establecer guías apropiadas para la notificación de contactos.

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## Introduction

*Chlamydia trachomatis* (CT) infections are a relevant public health problem due to their high incidence and consequences on reproductive health: pelvic inflammatory disease, ectopic pregnancy, tubal infertility, chronic pelvic pain and other complications.<sup>1</sup>

The incidence of CT in Spain in 2019 was 44.18/100,000 people, with women aged 20–24 being the most affected (343.64/100,000).<sup>2</sup> These figures are below those of the European Union as a whole (146/100,000), but it must be taken into account that notification of such cases to the Red Nacional de Vigilancia Epidemiológica [National Epidemiological Surveillance Network] is not yet implemented throughout the country. The countries with the highest rates, such as the United Kingdom (365/100,000) or Denmark (578/100,000), have screening programmes or generalised opportunistic screening systems, which do not exist in Spain.<sup>3</sup> CT prevalence studies conducted in Spain in the last decade have focused mainly on young people, with estimates ranging from 4.1% to 8.5%.<sup>4–7</sup>

Regarding lymphogranuloma venereum (LGV), it has become an endemic infection since the first case was published in Spain in 2005, mainly affecting men who have sex with men (MSM) with high rates of co-infection with human immunodeficiency virus (HIV).<sup>8</sup>

Strategies for the control of sexually transmitted infections (STIs) must be based on the local epidemiological situation, which is why we carried out this study, the objective of which was to describe the sociodemographic, behavioural and clinical characteristics of patients with CT infection in Biscay to be able to adapt our primary and secondary prevention interventions to the groups with the highest risk of acquiring this STI.

## Materials and methods

A descriptive study of proportional morbidity of a prospective case series, made up of all patients diagnosed with CT infection between September 2016 and January 2019 in the referral STI clinics in Osakidetza, in Biscay. These clinics serve the population of Biscay (1,152,651 inhabitants). The study was approved by the Clinical Research Ethics Committee of the Basque Country and the participants signed an informed consent form.

Following the usual care protocol, all patients (symptomatic or asymptomatic) who attended the clinics underwent a complete STI screening, which included serology for HIV, syphilis, hepatitis B and C, and taking samples from all the sites susceptible to infection: in MSM, from the pharynx, rectum and urethra; in heterosexual men, from the urethra; and in women, from the pharynx, vagina, endocervix, rectum (in case of anal intercourse) and urethra

(if endocervical samples could not be taken). Samples of any lesions were also taken.

For the microbiological study, both culture and molecular biology techniques were used. For the *Neisseria gonorrhoeae* culture, the GC-Lect plate (BD GC-Lect Agar, Becton Dickinson, Heidelberg/Germany) was used and for the *Trichomonas vaginalis* culture, a Roiron medium (Difco, Sentmenat, Barcelona, Spain) was used. Molecular biology techniques were performed with the BD MAX CT/GC/TV2 real-time nucleic acid amplification (Becton Dickinson, Heidelberg/Germany) that simultaneously detects CT, *N. gonorrhoeae* and *T. vaginalis* in urine samples and endocervical, urethral, pharyngeal and rectal smears sent in universal transport medium (Copan). In CT-positive samples from MSM, regardless of the site, and in positive rectal samples from women, the presence of CT bio-var L was studied using the RealCycler CHSL (Progenie) real-time polymerase chain reaction (PCR) technique that detects a specific sequence of the gene *pmpH*. For the detection of herpes simplex virus, RealCycler Monotest, herpesvirus type 1 + herpesvirus type 2 + varicella-zoster virus (Progenie Molecular, Valencia, Spain) was used in samples sent in universal transport medium (Copan).

The only inclusion criterion was having a CT isolate, and the exclusion criteria were being a temporary visitor to the region and/or not knowing the language which made it difficult to understand the informed consent.

The treatments were adjusted to the recommendations of the clinical practice guidelines.<sup>9,10</sup> Patients were informed of the need to abstain from sexual relations for the necessary time and of the reasons for studying their sexual contacts. The contacts were notified through the index case, and were offered appointments to be seen within a maximum period of one week. A follow-up visit was scheduled for all of them to verify the remission of symptoms, check the study of contacts and perform a test of cure (TOC) in case of persistence of symptoms, suspected re-exposure, poor adherence to treatment, pregnancy and rectal infections treated with azithromycin.<sup>9,10</sup> In suspected re-exposure and in pregnant women, samples were taken again from all sites susceptible to infection, while in the rest of the cases they were only taken from the initially affected sites. A positive TOC result was considered a reinfection when more than four weeks had passed since treatment,<sup>9–13</sup> adherence to treatment had been good, and re-exposure was suspected.

The study variables were collected and entered in real time by the physicians in an electronic database designed for the project. Sexual orientation in men was categorised as MSM and MSW (men who only have sex with women). The women who agreed to participate had sexual relations only with men. Cases with urethral or rectal discharge, leukorrhoea, dysuria, urethral discomfort, testicular pain, proctalgia, lower abdominal pain, dyspareunia, postcoital bleeding or pharyngeal discomfort were considered symptomatic.

## Analysis

Measures of central tendency and dispersion were calculated for the quantitative variables and proportions for the categorical ones, with their 95% confidence intervals. Comparisons between subgroups were made using Student's-t and X<sup>2</sup> tests. Factors associated with condom use, suspected re-exposure, and the study of contacts were identified by unconditional multiple logistic regression analysis. Statistical analyses were performed with SAS v9.4 (SAS Institute, Cary, NC, USA).

## Results

During the 29 months of the study, 960 patients with CT infection were treated. Of these, 54 (5.6%) refused to participate, 18 (1.9%) were excluded because they were temporary visitors or due to a language barrier, and 40 (4.2%) could not be invited to participate because they did not return to the clinic. In total, 847 patients (88.2%) agreed to participate. No significant differences were observed in terms of sex, age or country of origin between those who agreed and those who refused or those who could not be invited to participate.

### Demographic and behavioural characteristics

Most of the infections corresponded to men (58.9%), but when stratifying by sexual orientation, women ranked first (41.1%), followed by MSW (33.77%) and MSM (25.15%) (Table 1).

The average age was 32.6 years (range 16–68), higher among MSM (36 years) than between MSW (32) and women (30) ( $p < 0.0001$ ). One third (33.3%) of the women were under 25 years old vs. 20.8% of the men ( $p < 0.0001$ ) and 9.2% were under 20 years of age. One third of the patients had been born outside of Spain, mainly in Latin America (75.5%). The proportion of immigrants reached 38% among women while among MSM it was 25% ( $p = 0.0014$ ).

Overall, 62.7% had a regular partner and 37% had been with them for less than six months. There was no association between the length of a relationship and condom use, which was different between heterosexual patients (men or women) and MSM. The latter reported using a condom more in genital/anal sex, both with a regular partner (15.9% vs. 7.8% in MSW and 9% in women) and with casual partners (60.7% vs. 27.5% in MSW and 29.7% in women,  $p < 0.0001$ ). Some 42% of the MSM always used a condom during genital/anal sex regardless of the type of partner (stable or casual) vs. 12% and 12.8% of MSW and women ( $p < 0.0001$ ). Regarding oral sex, less than 1% of patients always used a condom.

MSM had more sexual contacts, 5.4 on average in the three months prior to diagnosis, vs. two for MSW and 1.5 for women ( $p < 0.0001$ ), and 16.6% of them reported using drugs and/or alcohol linked to sexual activity vs. almost 4% of MSW and 3% of women ( $p < 0.0001$ ).

### Clinical characteristics

The main reason for consultation in men was due to symptoms (55%), while women came essentially for the study of contacts (39.9%) ( $p < 0.0001$ ) (Table 2).

There were 33 cases of LGV, all but one in MSM: 18% of the CT infections in MSM were LGV, 28 (87.5%) of which were located in the rectum, two (6.25%) in the urethra, one (3.1%) in the pharynx and one (3.1%) in a lesion. While 78.6% of the rectal LGVs presented with symptoms, the case detected in the pharynx and one of the two identified in the urethra were asymptomatic. Some 48.5% of LGVs occurred in patients with HIV infection.

81 patients (9.6%) had HIV infection: 35% of the MSM, 0.7% of the MSW, and 1.2% of the women ( $p < 0.0001$ ). In nine cases it was

a new infection, diagnosed at the same time as the CT (eight in MSM and one in a woman).

A history of STIs (excluding HIV) was also more frequent among MSM: 71.4% vs. 25.9% in MSW and 23% in women ( $p < 0.0001$ ), as well as the presence of other concurrent STIs: 53.5% vs. 22.4% in MSW and 18.7% in women ( $p < 0.0001$ ). Concurrent STIs in MSM were gonorrhoea (26.8%), early syphilis (21.1%), genital herpes (5.2%), warts (4.7%) and new diagnosis of HIV (3.7%); in MSW, gonorrhoea (8.7%), warts (7.3%) and genital herpes (4.5%); and in women, gonorrhoea (5.5%), genital herpes (4.3%), warts (2.3%) and trichomonas (1.8%).

In all, 64.3% of MSW had symptoms, higher than MSM (45%) and women (30.2%) ( $p < 0.0001$ ), in whom the majority were asymptomatic infections.

In 17.8% of MSM and 21.5% of women, CT was isolated in more than one site (Table 3). The rectum was affected in 69.5% of MSM, the urethra in 31.4%, and the pharynx in 14.5%. Rectal infections were symptomatic in 34.5% of cases, urethral infections in 62.7%, and pharyngeal infections were all asymptomatic. The cervix was affected in 86.5% of women, the rectum in 17.6%, and the pharynx in 13.8%. Cervical infections were symptomatic in 33% of cases, rectal infections in 1.7%, and pharyngeal infections were always asymptomatic.

Table 4 shows the clinical characteristics of the patients whose reasons for consultation were a *study of contacts* or an *STI screening*. Among the former, 98% were asymptomatic and almost a quarter had an extragenital infection (rectum/pharynx). In addition to CT infection, 18.4% had other STIs, mainly gonococcal infections (12%) and four new cases of HIV were diagnosed, all in MSM. Among those who came for *screening*, more than half (54%) had a history of STIs and 44% had another STI in addition to CT (14% warts, 12% syphilis, 12% herpes and 7% gonorrhoea).

### Check-up visit (Table 2)

The average time between diagnosis and check-up visit was 41 days (median 40 days) and 790 patients (93.3%) attended. Of these, 208 (26.3%) met one or more criteria to perform a TOC, although it was only performed in 183 (88%), obtaining 37 positive results (20.2%). In all of these, four weeks had passed since treatment. 11 (21.1%) patients with rectal infection treated with azithromycin had a positive TOC, eight had had unprotected intercourse after treatment, but in the other three it could be a failure of azithromycin. Four of the six patients with persistent symptoms and a positive TOC had also been exposed to a possible reinfection, while the other two, treated with azithromycin, denied having had sexual intercourse since treatment. Reinfection was considered to have occurred in 32 of the 183 cases who underwent a TOC (17.5%; 4% of the total) and possible azithromycin failure in 5.7% of the rectal CT infections treated with this antibiotic. In all, 380 of the 582 patients who did not meet the criteria for a TOC also had one (some doctors requested it for all their patients). The result was positive in nine cases (2.3%).

It was only possible to do the study of contacts in 58.6% of the cases.

### Multivariate analysis

After adjusting for age, sexual orientation, country of origin, HIV infection and substance use, inconsistent condom use was 50% more frequent among immigrants and five times more frequent among MSW and women than among MSM. The same characteristics were associated with suspected re-exposure: 75% more frequent among immigrants and twice as frequent among MSW and in women than among MSM. Assessment of contacts was twice as

**Table 1**  
Demographic and behavioural characteristics of patients with *Chlamydia trachomatis* infection.

	Total (847)			Men (499, 58.9%)							Women (348, 41.1%)			
	n	%	95% CI	MSM (213, 25.1%)			MSW (286, 33.8%)				n	%	95% CI	p Value <sup>b</sup>
				n	%	95% CI	n	%	95% CI	p Value <sup>a</sup>				
<b>Age</b>														
16–19	52/847	6.14	4.6–7.9	6/213	2.82	1.04–6.03	14/286	4.90	2.7–8.0	0.3654	32/348	9.2	6.3–12.7	0.0091
20–24	168/847	19.83	17.2–22.7	33/213	15.49	10.9–21.0	51/286	17.83	13.6–22.8		84/348	24.14	19.7–29.0	
≥25	627/847	74.03	70.9–76.9	174/213	81.69	75.8–86.6	221/286	77.27	71.9–82.0		232/348	66.67	61.4–71.6	
<b>Immigrant</b>														
Yes	277/847	32.7	29.5–36.0	53/213	24.88	19.2–31.2	92/286	32.17	26.8–37.9	0.0762	132/348	37.93	32.8–43.2	0.1309
<b>Stable partner</b>														
Yes	531/846	62.77	59.4–66.0	93/213	43.66	36.9–50.6	193/286	67.48	61.7–72.8	<0.0001	245/347	70.61	66.5–75.3	0.3971
<b>Partners in last month<sup>c</sup></b>														
Average	1.35	----	1.26–1.45	2.08	–	1.76–2.39	1.26	–	1.13–1.39	<0.0001	1.0	----	0.9–1.07	0.0003
<b>Partners in last 3 months<sup>c</sup></b>														
Average	2.60	----	2.32–2.88	5.44	–	4.43–6.45	1.97	–	1.77–2.18	<0.0001	1.48	----	1.37–1.6	<0.0001
<b>Partners in last year<sup>c</sup></b>														
Average	6.99	----	5.50–8.48	18.11	–	12.3–23.9	4.0	–	3.47–4.52	<0.0001	2.92	----	2.5–3.3	0.001
<b>Time with partner</b>														
<1 month	26/517	5.03	3.3–7.3	1/93	1.08	0.03–5.8	15/189	7.94	4.5–12.7	<0.0001	10/235	4.26	2.06–7.69	0.2421
1–6	165/517	31.91	27.9–36.1	17/93	18.28	11.0–27.6	70/189	37.04	30.1–44.3		78/235	33.19	27.2–39.6	
6–12	81/517	15.67	12.6–19.1	6/93	6.45	2.4–13.5	29/285	15.34	10.5–21.3		46/235	19.57	14.7–25.2	
>12	245/517	47.39	43.0–51.8	69/93	74.19	64.0–82.7	75/285	39.68	32.6–47.0		101/235	42.98	36.5–49.5	
<b>Condom with regular partner</b>														
<b>Genital/anal sex</b>														
Always	51/521	9.79	7.4–12.7	14/88	15.91	8.9–25.2	15/191	7.85	4.4–12.6	0.0445	22/242	9.09	5.8–13.4	0.6607
Sometimes	90/521	17.27	14.1–20.8	18/88	20.45	12.6–30.4	29/191	15.18	10.4–21.0		43/242	17.77	13.2–23.2	
Never	380/521	72.94	68.9–76.7	56/88	63.64	52.7–73.6	147/191	76.96	70.3–82.7		177/242	73.14	67.1–78.6	
<b>Oral sex</b>														
Always	3/518	0.57	0.12–1.65	2/92	2.17	0.26–7.6	0/192	0	----	0.0090	1/244	0.41	0.01–2.26	0.7408
Sometimes	2/528	0.38	0.05–1.36	0/92	0	----	1/192	0.52	0.01–1.54		1/244	0.41	0.01–2.26	
Never	487/528	92.23	89.6–94.3	90/92	97.83	92.4–99.7	177/192	92.19	87.4–95.5		220/244	90.16	85.7–93.6	
Does not practise	36/528	6.82	4.8–9.3	0	0		14/192	7.29	4.0–11.9		22/244	9.02	5.7–13.3	
<b>Condom with casual partners</b>														
<b>Genital/anal sex</b>														
Always	239/621	38.49	34.6–42.4	116/191	60.73	53.4–67.7	58/211	27.49	21.5–34.0	<0.0001	65/219	29.68	23.7–36.2	0.6676
Sometimes	224/621	36.07	32.3–40.0	64/191	33.51	26.8–40.6	83/211	39.34	32.7–46.3		77/219	35.16	28.8–41.9	
Never	158/621	25.44	22.0–29.0	11/191	5.76	2.9–10.0	70/211	33.18	26.8–39.9		77/219	35.16	28.8–41.8	
<b>Oral sex</b>														
Always	12/645	1.86	0.96–3.23	3/200	1.50	0.31–4.3	5/220	2.27	0.74–5.22	0.0037	4/225	1.78	0.49–4.5	0.9473
Sometimes	14/645	2.17	1.2–3.6	3/200	1.50	0.31–4.3	5/220	2.27	0.74–5.22		6/225	2.67	0.98–5.7	
Never	571/645	88.53	85.8–90.8	190/200	95.00	91.0–97.5	187/220	85.00	79.6–89.7		194/225	86.22	81.0–90.4	
Does not practise	48/645	7.44	5.5–9.7	4/200	2.00	0.55–5.04	23/220	10.45	6.7–15.2		21/225	9.33	5.8–13.9	
<b>Condom for genital/anal sex</b> (regular partner and/or casual partners)														
Always	166/834	19.90	17.2–22.8	88/209	42.11	35.3–49.1	34/282	12.06	8.5–16.4	<0.0001	44/343	12.83	9.5–16.8	0.7716
<b>Condom for oral sex</b> (regular partner and/or casual partners)														
Always	7/760	0.92	0.3–1.9	3/208	1.44	0.3–4.16	3/254	1.18	0.24–3.41	0.8051	1/298	0.34	0.01–1.8	0.2431
<b>Substances (drugs and/or alcohol)</b>														
Yes	55/832	6.61	5.0–8.5	34/205	16.59	11.7–22.4	11/284	3.87	1.9–6.8	<0.0001	10/343	2.92	1.4–5.3	0.5070
<b>Sex worker</b>														
Yes	9/846	1.06	0.5–2.0	4/213	1.88	0.5–4.7	0	0	–	0.0200	5/347	1.44	0.5–3.3	0.0415
<b>Pays for sex</b>														
Yes	17/846	2.01	1.2–3.2	2/213	0.94	0.1–3.35	13/286	4.55	2.4–7.6	0.0196	1/347	0.29	0.01–1.6	0.0003

MSM: men who have sex with men; MSW: men who have sex with women.

<sup>a</sup> Comparison MSM vs. MSW.

<sup>b</sup> Comparison MSW vs. women.

<sup>c</sup> Excluding sex workers.

**Table 2**  
Clinical characteristics of patients with *Chlamydia trachomatis*.

	Total (847)			Men (499)						Women (348, 41.1%)				
	n	%	95% CI	MSM (213, 25.1%)			MSW (286, 33.8%)			p <sup>a</sup>	n	%	95% CI	p <sup>b</sup>
				n	%	95% CI	n	%	95% CI					
<b>Initial visit</b>														
<i>Reason for consultation</i>														
Symptoms	378/847	44.63	41.2–48.0	92/213	43.19	36.4–50.1	182/286	63.64	57.7–69.2	<0.0001	104/348	29.98	25.1–35.0	<0.0001
Contact	250/847	29.52	26.4–32.7	49/213	23.00	17.5–29.2	62/286	21.68	17.0–26.9		139/348	39.94	34.7–45.3	
Screening	204/847	24.09	21.2–27.1	71/213	33.33	27.0–40.1	42/286	14.69	10.8–19.3		91/348	26.15	21.6–31.1	
Other	15/847	1.77	1.0–2.9	1/213	0.47	0.01–2.5	0	0	-----		14/348	4.02	2.2–6.6	
<i>LGV</i>														
Yes	33/268	12.31	8.6–16.8	32/177 <sup>c</sup>	18.08	12.7–23.7	1/23	4.35	0.1–21.9	<0.0001	0/68	0	–	0.2527
<i>Symptoms</i>														
Yes	385/847	45.45	42.0–48.8	96/213	45.07	38.2–52.0	184/286	64.33	58.5–69.9	<0.0001	105/348	30.17	25.4–35.3	<0.0001
<i>Multiple site</i>														
Yes	127/837	15.17	12.9–17.7	38/213	17.84	12.8–23.0	0/284	0	-----	<0.0001	73/340	21.47	17.2–26.2	<0.0001
<i>HIV infection</i>														
Yes	81/841	9.63	7.7–11.8	75/213	35.21	28.8–42.0	2/286	0.70	0.08–2.5	<0.0001	4/342	1.17	0.32–2.9	0.5463
<i>Previous STIs (not HIV)</i>														
Yes	306/846	36.17	32.9–39.5	152/213	71.36	64.8–77.3	74/286	25.87	20.9–31.3	<0.0001	80/347	23.05	18.7–27.8	0.6940
<i>Other simultaneous STI</i>														
Yes	243/847	28.69	25.6–31.8	114/213	53.52	46.6–60.3	64/286	22.38	17.7–27.6	<0.0001	65/348	18.68	14.7–23.2	0.2496
<b>Check-up visit</b>														
<i>Attended check-up</i>														
Yes	790/847	93.27	91.4–94.8	198/213	92.9	88.6–96.0	269/286	94.06	90.6–96.5	0.4382	323/348	92.82	89.6–95.3	0.3651
<i>Contacts studied</i>														
Yes	457/780	58.59	55.0–62.0	75/194	38.66	31.7–45.9	159/267	59.55	53.4–65.5	<0.0001	223/319	69.91	64.5–74.9	0.0088
<i>Suspected re-exposure</i>														
Yes	117/780	15.00	12.6–17.7	17/196	8.67	5.1–13.2	46/264	17.42	13.0–22.5	0.0069	54/320	16.88	12.9–21.4	0.8608
<i>Persistence of symptoms</i>														
Yes	28/357	7.84	5.3–11.1	6/90	6.67	2.5–13.9	14/172	8.14	4.5–13.3	0.6698	8/95	8.42	3.7–15.9	0.9362
<i>Poor adherence</i>														
Yes	4/775	0.52	0.1–1.32	2/195	1.03	0.12–3.6	1/267	0.38	0.01–1.13	0.3992	1/318	0.31	0.01–1.74	0.8907
<i>CT in rectum treated with azithromycin</i>														
Yes	75/200	37.5	30.7–44.6	36/140	25.71	18.7–33.7	–	–	–		39/60	65.0	51.6–76.8	<0.0001 <sup>i</sup>
<i>Criteria for test of cure</i>														
Yes	208/790	26.33	23.3–29.5	56/198	28.28	22.1–35.1	55/269	20.45	15.8–25.7	0.0493	97/323	30.01	25.1–35.3	0.0079
<i>Test of cure</i>														
Positive	37/183	20.22	14.6–26.7	8/47	17.02	7.6–30.8	16/54	29.63	17.9–43.6	0.1376	13/82	15.85	8.7–25.5	0.0550
<b>Positive test for cure in:</b>														
Pregnancy	1/4	25.0	3.41–71.0	–	–	–	–	–	–	–	1/4	25.0	3.41–71.0	----
Suspected re-exposure <sup>d</sup>	31/114	27.2	19.3–36.3	6/18	33.3	13.3–59.0	13/44	29.55	16.8–45.2	0.7690	12/52	23.1	12.5–36.8	0.4718
Persistence of symptoms <sup>d</sup>	6/28	21.4	9.8–39.9	0/6	0	–	6/14	42.86	21.3–67.4		0/8	0	–	
Poor adherence <sup>d</sup>	1/4	25.0	3.41–71.0	0/2	0	–	1/1	100	0.1–1.0		0/1	0	–	
Rectal CT azithromycin treatment <sup>d</sup>	11/52	21.1	11.0–34.7	6/27	22.22	8.6–42.2	–	–	–	–	5/25	20.0	8.4–39.5	0.8446 <sup>e</sup>

CT: *Chlamydia trachomatis*; MSM: men who have sex with men; MSW: men who have sex with women; STI: sexually transmitted infection; LGV: lymphogranuloma venereum; HIV: human immunodeficiency virus.

<sup>a</sup> Comparison MSM vs. MSW.

<sup>b</sup> Comparison MSW vs. women.

<sup>c</sup> In the first months of the study, not all MSM patients were screened for LGV.

<sup>d</sup> A patient can be in more than one category.

<sup>e</sup> comparison MSM vs. women.



**Table 3**  
Sites of *Chlamydia trachomatis* infection.

Site	MSM (213)				MSW (284)*				Women (340)**			
	n	%	Symptoms	%	n	%	Symptoms	%	n	%	Symptoms	%
Rectum	114	53.5	45	39.5					15	4.4	0	0
Rectum + pharynx	17	8.0	3	17.6					5	1.5	1	20
Urethra	47	22.0	30	63.8	282	98.3	182	64.0	10	2.9	1	10
Urethra + rectum	17	8.0	12	70.5					2	0.6	1	50
Urethra + pharynx	3	1.4	1	33.3					3	0.9	1	33.3
Lesion	4	1.9	4	100	2	0.7	2	100				
Pharynx	10	4.7	0	0					11	3.2	0	0
Pharynx + conjunctiva	1	0.4	1	100								
Cervix									231	67.9	90	38.9
Cervix + pharynx									25	7.3	4	16.0
Cervix + rectum									35	10.3	3	8.6
Cervix + rectum + pharynx									3	0.9	0	0

MSM: men who have sex with men; MSW: men who have sex with women.

\* n = 286, in 2 cases the site was not recorded.

\*\* n = 348, in 8 cases the site was not recorded.

**Table 4**  
Clinical characteristics of patients with *Chlamydia trachomatis* according to reason for consultation.

	Study of contacts								Screening							
	Total (250)		MSM (49)		MSW (62)		Women (139)		Total (204)		MSM (71)		MSW (42)		Women (91)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Absence of symptoms	245	98.0	45	91.8	62	100	138	99.3	204	100	71	100	42	100	91	100
Site																
Genital <sup>a</sup>	191	76.7	13	26.5	62	100	116	84.0	126	62.3	15	21.1	42	100	69	78.4
Extra-genital <sup>b</sup>	58	23.3	36	73.5			22	16.0	75	37.3	56	78.9	0	0	19	21.6
Multiple sites	54	21.7	12	24.5	0	0	42	30.4	35	17.4	12	16.9	0	0	23	26.1
LGV	2	0.8	2	4.0	0	0	0	0	6	2.9	6	8.4	0	0	0	0
History of STIs (not HIV)	59	23.8	29	59.2	13	21.3	17	12.3	110	54.5	56	78.8	16	38.1	38	42.7
HIV	18	7.2	16	32.6	1	1.6	1	0.7	34	16.8	32	45.1	0	0	2	2.2
Other simultaneous STI	46	18.4	22	44.9	5	8.0	19	13.6	90	44.1	38	53.5	23	54.7	29	31.8

MSM: men who have sex with men; MSW: men who have sex with women; STI: sexually transmitted infection; LGV: lymphogranuloma venereum; HIV: human immunodeficiency virus.

<sup>a</sup> Cervix/urethra.

<sup>b</sup> Rectum/pharynx.

**Table 5**  
Factors associated with the use of condoms, the study of contacts and the suspicion of re-exposure. Multivariate analysis, logistic regression.

	Non-regular use of condoms			Suspected re-exposure			Study of contacts		
	ORa	95% CI	p Value	ORa	95% CI	p Value	ORa	95% CI	p Value
Country of origin			0.0597			0.0075			NS
Spain	Reference			Reference					
Other	1.54	0.98–2.40		1.75	1.16–2.63				
Sexual orientation			<0.0001			0.0356			<0.0001
MSM	Reference			Reference			Reference		
MSW	5.35	3.32–8.62		2.13	1.16–3.90		2.23	1.54–3.27	
WSM	5.20	3.30–8.19		2.05	1.13–3.73		3.62	2.47–5.29	

MSM: men who have sex with men; MSW: men who have sex with women; 95% CI: 95% confidence interval; WSM: women who have sex with men; NS: not significant; ORa: odds ratio adjusted for age, sexual orientation, country of origin, HIV infection and drug use.

likely among MSW as among MSM and three times as likely among women (Table 5).

**Discussion**

This study provides, to our knowledge, the most exhaustive clinical-epidemiological description carried out in Spain of a prospective case series of CT infection, including a high number of patients (847) of both sexes with an age range between 16 to 68 years.

The majority of the cases corresponded to women (one in three under 25 years of age) followed by MSW and MSM. Immigrants, who in the Basque Country constitute 10% of the population, accounted for 33% of the cases (38% among the women), with 75% of

them coming from Latin America. This is consistent with what has been reported in other studies<sup>5,7</sup> and with the higher prevalence of CT infection in this region, especially in women.<sup>14</sup>

Women had fewer sexual partners and, although their use of condoms in genital/anal sex was very low (12%), it was similar to that of MSW. That women were more affected may be due to biological characteristics such as cervical ectopia in young women, which make them more vulnerable to CT infection. On the other hand, if men have more sexual partners, they can transmit the infection to multiple women, increasing the incidence and prevalence of infection among them.<sup>14</sup>

One of the difficulties in controlling CT infections is their frequently asymptomatic nature.<sup>10</sup> Our results do not deviate from the model: 70% of women, 55% of MSM and 36% of MSW did

not present symptoms. This shows the need for an active search for cases, because without screening, these silent infections will not be diagnosed or treated, perpetuating their transmission. To date, the only activity to control CT infection in the Basque Country and most of Spain consists of managing symptomatic cases, when more than half are asymptomatic and, with the exception of Catalonia,<sup>15,16</sup> there are no recommendations for the detection of infections asymptomatic in any population subgroup. Prevalence studies in the general sexually active population are necessary to determine whether the implementation of population screening programmes would be justified and cost-effective. However, our results, in line with prevalence studies in our setting,<sup>5–7</sup> show the need to at least carry out opportunistic screenings in women under 25 years of age and young immigrants of both sexes, with genital and extragenital sampling.

Rectal involvement, as in other studies,<sup>17,18</sup> was greater than urethral involvement in MSM (69.5% vs. 31.4%). If only genital samples had been taken (urethra/urine in men and cervix in women), we would not have detected 68.5% of infections among MSM or 13.5% among women. Many cases of CT infection are missed if samples are not collected from all susceptible sites, and therefore patients must be asked about their sexual practices and explained the reason for doing so. This entails more consultation time and evidently higher costs, but not doing so favours the continued transmission of the infection, the consequences of which can be more expensive than its early detection and treatment.

In 42% of patients we could not study any contacts, a worrying result, although somewhat better than that obtained in the evaluation of compliance in the study of contacts by Vilela et al.<sup>19</sup> The probability that contacts are infected is high: the estimated probability of transmission of CT in a single sexual act is 10%<sup>20</sup> and the concordance of infection between couples is 75%.<sup>21</sup> The fact that a large part of CT infections are asymptomatic increases the value of studying contacts, since it may be the only way to treat these cases.<sup>22</sup> In fact, 98% of the patients in our study whose reason for consultation was having had sex with someone who had a CT infection were asymptomatic and 21.7% of them were infected in more than one anatomical site.

Notifying contacts is essential for controlling CT transmission. In Spain, it is done through the index case, which is problematic when the contacts are unknown, when the relationship with them has ended or when the contagion has occurred outside the usual partner. There are no notification guidelines adapted to our epidemiological situation, and it is crucial to develop them and provide the necessary means for their implementation, as well as to evaluate new notification methods based on new technologies.<sup>23</sup>

One in four patients who returned for a check-up met one or more criteria to perform a TOC: 17% of them had been reinfected and in 6% of the rectal CT infections treated with azithromycin there was suspicion of treatment failure. This has implications for care: it is not enough to prescribe a therapy to patients with CT infection at the time of diagnosis, but they must be given a follow-up appointment to verify whether or not they require a TOC and to take samples if they do. On the contrary, our results show the poor performance of TOCs in the absence of the criteria established in the STI guidelines.

This study has several limitations. It was carried out in the Osakidetza STI clinics in Biscay, so its results may not exactly represent what happens in the general population. Even so, they are the referral STI clinics of the public health system and provide follow-up of more than 82% of CT infections reported to the Basque Government's Department of Health by the microbiology laboratories of Biscay. Therefore, we consider that, in the absence of population studies, these results are valuable to approximate the epidemiological situation of our population. The reinfection rate may be overestimated, since we established the minimum time

between treatment and TOC at four weeks, based on European and American clinical practice guidelines and other publications,<sup>9–13</sup> but the recommendations in this regard are inconsistent and some suggest postponing the TOC for up to six weeks because of the possibility of false-positive results due to the detection of non-viable organisms until this amount of time has passed. Finally, the estimated therapeutic failure for azithromycin in rectal infections (6%), although less than the 17% obtained in the meta-analysis by Kong et al.,<sup>24</sup> must be considered with caution, since it was not molecularly determined if it was the same strain.

In conclusion, although the generalisation of molecular techniques has facilitated the diagnosis of CT infections, it is evident that their management is not as simple as taking a urine sample or a vaginal smear and prescribing an antibiotic. We are faced with infections that are mostly asymptomatic, which can cause severe complications, frequently extragenital, in more than one anatomical site and with other concurrent STIs, which mainly affect young women, often immigrants, with a history of previous STIs, who barely use condoms and sometimes become reinfected within a short period of time. To ensure quality care, STIs require specialised clinics, equipped with the necessary resources and integrated with primary care, reproductive health services, school health services and community organisations.

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## Conflicts of interest

The authors declare that they have no conflicts of interest.

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