Who has chlamydia? The prevalence of genital tract *Chlamydia trachomatis* within Portsmouth and South East Hampshire, UK

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Abstract

Objective. To determine the prevalence of genital tract *Chlamydia trachomatis* infection in women and men attending different health care settings in Portsmouth and South East Hampshire.

Design. Prospective, opportunistic screening.

Setting. Multiple health care sites.

Participants. Consenting sexually active women and men.

Intervention. A urine sample was tested for *Chlamydia trachomatis* and positive patients were offered treatment and partner notification.

Main outcome measures. The presence or absence of *chlamydia* infection according to age, gender, health care setting and reason for attendance.

Results. A total of 14 756 samples were tested giving an overall prevalence of 9.6%. The prevalence was significantly higher in women attending for a termination of pregnancy, antenatal care, women and men attending genitourinary medicine and in those with genital tract symptoms. The prevalence was different for men and women at different ages.

Conclusion. The prevalence of genital *Chlamydia trachomatis* infection was high but differed at various health care settings and by reason for attendance.

often remains undiagnosed.² If left untreated, chlamydia may cause pelvic inflammatory disease (PID), ectopic pregnancy, and infertility.^{3,4} The prevalence of *C. trachomatis* in the UK has not been accurately determined, as current estimates have largely been obtained from selected populations, such as attenders at GUM and termination of pregnancy (TOP) clinics. Previous studies have reported a prevalence of between 1% and 29% depending on the population studied, the selection criteria and diagnostic tests used, with the highest rates found in under 25-year-olds.^{5–12}

Studies in other countries have shown that screening and treatment for *C. trachomatis* significantly reduces the prevalence of the infection and PID in women.^{13–15} In 1998 the Chief Medical Officer (CMO) published the report of the CMO's Expert Advisory Group on *Chlamydia trachomatis*⁵ which was set up to consider the practical implications of screening. One of the report's recommendations was that screening for chlamydia should be offered to sexually active women aged under 25 years, especially teenagers. The Department of Health (DH) set up pilot sites, at Portsmouth and the Wirral, to assess the feasibility, effectiveness, and acceptability of opportunistic testing for genital tract *C. trachomatis* infection in women aged 16–24 years.¹⁶ The data from this study have been analysed and here we present the prevalence results obtained within the Portsmouth population.

Participants and methods

The pilot study was a prospective, opportunistic screening programme carried out at multiple health care sites over 12 months, and began on 1 September 1999. Women and men fulfilling the inclusion criteria attending any of the screening sites for any reason were provided with written and verbal information about the study and were asked to complete the first part of the request form, whether or not they agreed to provide a sample. Those who agreed to take part gave verbal consent to join the study. Included in the demographic data collected were date of birth, gender, address or phone number for result notification, and the screening site attended. In addition, the main reason for attendance at the health care site, and the reason for the chlamydia test, were recorded. Ethical committee approval was obtained. The study was organised by a local steering group and two research nurses were appointed to co-ordinate patient management. Further details on the management of the study are available on the DH website.¹⁷

Key message points

- This is the largest study for genital *Chlamydia trachomatis* carried out in the UK to date, opportunistically screening 14 756 urine samples obtained when patients attended a health care setting.
- A higher than expected prevalence of 8.3% was obtained with samples obtained from patients attending their general practitioner.
- The overall prevalence of 9.6% and the prevalence for each of the various patient groups were higher than those found in previous studies. The highest prevalence was obtained with samples from males and females attending genitourinary medicine, those with genital tract symptoms, and females attending for antenatal care and termination of pregnancy.
- The higher prevalence may be due to the increased sensitivity of molecular methodology.
- The findings suggest that opportunistic screening for *C. trachomatis* in primary care is possible.

Introduction

Genital *Chlamydia trachomatis* infection is the commonest bacterial sexually transmitted infection (STI) in the UK with over 56 000 new cases diagnosed in genitourinary medicine (GUM) clinics every year.¹ Previous studies have shown that 70% of women and 50% of men infected with chlamydia are asymptomatic and therefore the infection

Patients agreeing to take part were then asked to produce a first-void urine sample for chlamydia testing. Those unable to produce a sample in the clinic were asked to do so at home and return it to the clinic or other collection service on the same day. Samples were collected in sterile containers with no additives, transported to the laboratory by the routine pathology collection service, and were stored at -20°C until tested.

Inclusion criteria for the DH pilot study

The inclusion criteria for the pilot study were as follows:

1. All women aged 16–24 years who had ever had sexual intercourse.
2. Men aged 16–24 years who attended GUM and Sex Sense (young person) clinics.
3. Males and females under 16 years who attended for sexual health issues and were deemed competent under the Fraser ruling.
4. Men and women in the above categories who had previously been screened but who had changed their sexual partner.

In addition, for this evaluation, urine specimens obtained from men and women aged 25 years and over attending a sexual health setting were also included.

Screening sites

The different screening sites are listed in Table 1. The 'special target groups' were students and homeless people, who were offered screening by the research nurses at the college/university or at the hostel.

Chlamydia detection

The urine samples were tested using a nucleic acid amplification method, the ligase chain reaction (Abbott LCx[®] *Chlamydia trachomatis* Assay; Abbott Laboratories, Maidenhead, UK). The testing was carried out according to the manufacturer's protocol except that an equivocal range (signal/cut-off ratio = 0.5–1.5) was created to reduce the number of false-positive and false-negative results. Samples giving positive or equivocal results were repeated using the same test. Samples giving discrepant or equivocal results in the two tests were tested again using another molecular test, the polymerase chain reaction (Roche Cobas Amplicor[®] *Chlamydia trachomatis* Test; Roche Diagnostics, Lewes, UK). Results were reported as not detected, detected, or equivocal. If the final result was still equivocal, repeat samples were requested from those patients and retested.

Notification of results

The research nurse informed the patient of their result in the manner, usually by letter or phone, that they had specified on the request form. Patients with positive chlamydia results were asked to contact the research nurse for further information and to arrange treatment. Patients were referred to GUM for treatment and partner notification, and a full sexual health screen was also offered (data to be published elsewhere). Patients who were not able to attend GUM were seen and treated by the research nurse in a family planning clinic (FPC) accessible to the patient. The research nurse made three attempts to contact positive patients who failed to present for treatment.

Statistical methods

The prevalence of *C. trachomatis* and the Exact (Clopper-Pearson) 95% confidence interval (CI) was calculated for each screening site and 'reason for attendance' (Tables 1 and 2 and Results section). The association between genital

tract symptoms and the prevalence of *C. trachomatis* was calculated using the Chi-squared test (Table 3). The 95% error bars in Figures 1 and 2 have been calculated using the Exact (Clopper-Pearson) 95% CI for proportion. In the Results section the significance of the age prevalence trend was calculated by Pearson Product-Moment correlation and Chi-squared test for linear trend. The significance of prevalence in each age group was calculated by Chi-squared test for equality of several independent proportions. The statistics packages used included Microsoft Excel and Arcus QuickStat [Arcus QuickStat (Biomedical) Research Solutions, Cambridge, UK].

Results

The results of the initial opportunistic screen are presented. The test of cure and contacts of known positive individuals have been excluded.

Table 1 shows the number of samples tested, the number positive, and the prevalence of chlamydia infection for each screening site. The total of 14 756 samples included 13 754 from women (183 under 16 years and 707 age 25 years and over), 998 from men (seven under 16 years and 120 age 25 years and over) and four unrecorded sexes. Approximately 8% were repeat samples from the same patients. The highest prevalences were for GUM male attendees (16%), GUM female attendees (13.4%) and Sex Sense attendees (12.1%). However, the number of samples tested from the Sex Sense clinics was small (257 women and 40 men) and the 95% confidence interval was between 8.6% and 16.4%. The prevalence of chlamydia infection in women attending their general practitioner (GP) was lower than the mean at 8.3%.

The prevalence of chlamydia infection varied according to the reason for attendance regardless of the health care setting and the results are shown in Table 2. The highest prevalences were found in women attending GUM for sexual health screening (13.9%), antenatal care (12.9%), for TOP (12.7%) and patients (male and female) attending because of genital tract symptoms (16%). The prevalence for women attending for antenatal care at any testing site (Table 2) is different from that obtained in Table 1 for those women attending an antenatal clinic. In Table 2, the total includes 202 women who attended their GP with a prevalence of 14%, 23 who attended a FPC with a prevalence of 30%, and one who attended GUM and was positive. This compares with a prevalence of 8.4% in those attending antenatal clinics. The results for GUM patients in Table 1 include all attenders fulfilling the inclusion criteria whereas those in Table 2 are patients attending for an STI screen only and excludes patients attending for other reasons such as those with symptoms.

Table 3 shows the prevalence in all male and female patients attending the testing site or having a chlamydia test because of genital tract symptoms compared with the prevalence in patients attending and being tested for other reasons.

The prevalence of chlamydia infection also varied with age and was different for men and women. Figure 1 shows that the prevalence in women aged 19 years was significantly higher than the mean of all age (16–26 years) groups ($p < 0.001$) but there was no significant linear trend. In men, the prevalence increased significantly with age 16–26 years ($p < 0.02$) (Figure 2).

Discussion

This is the largest study for genital *C. trachomatis* carried out in the UK to date, opportunistically screening 14 756 urine samples (not individual patients; some patients had

Table 1 Prevalence of Chlamydia trachomatis in patients attending different health care settings^a

Testing site	Sites (n)	Samples tested ^b (n)	Samples positive ^b (n)	Prevalence (%) (CI)
General practice	83	7913	654	8.3 (7.7–8.9)
Family planning clinics	10	3753	366	9.8 (8.8–10.7)
GUM females	3	1400	187	13.4 (11.6–15.3)
GUM males	3	812	130	16.0 (13.6–18.7)
Sex Sense clinics	5	297	36	12.1 (8.6–16.4)
Special target males ^c	7	134	7	5.2 (2.1–10.5)
Special target female ^c	7	162	10	6.2 (3.0–11.1)
Antenatal clinics	5	179	15	8.4 (4.8–13.4)
Other ^d	7	106	7	6.6 (2.7–13.1)
Total	123	14756	1412	9.6 (9.1–10.1)

^aData exclude tests of cure and contacts of positive individuals.
^bNumber of samples, not patients.
^cRefer to text for explanation of ‘special target’.
^dIncludes gynaecology, colposcopy and infertility clinics and unknown source.

Table 2 The prevalence of Chlamydia trachomatis infection for each reason for attendance regardless of health care settings^a

Reason for attendance	Samples tested ^b (n)	Samples positive ^b (n)	Prevalence (%) (CI)
Contraception	4692	434	9.2 (8.4–10.1)
Non-genital tract	3262	274	8.4 (7.5–9.4)
Chlamydia screening only	1260	132	10.5 (8.8–12.3)
TOP	411	52	12.7 (9.6–16.3)
Antenatal care	404	52	12.9 (9.8–16.5)
Genital tract symptoms	1202	192	16.0 (13.9–18.2)
STI screen (GUM) female	533	74	13.9 (11.1–17.1)
STI screen (GUM) male	295	28	9.5 (6.4–13.4)
Cervical smear	331	27	8.2 (5.4–11.6)
Other not stated	1614	94	5.8 (4.7–7.1)
Previous unsatisfactory test	633	46	7.3 (5.4–9.6)
Other genital tract ^c	119	7	5.9 (2.4–11.7)
Total	14756	1412	9.6 (9.1–10.1)

^aData exclude tests of cure and contacts of positive individuals.
^bNumber of samples, not patients.
^cIncludes gynaecology and infertility clinics.
CI, Confidence interval; GUM, genitourinary medicine; STI, sexually transmitted infection; TOP, termination of pregnancy.

more than one sample tested) obtained while patients attended a health care setting for any reason. It differs from previous studies in that it includes samples from all eligible patients regardless of the reason for attendance at the health care site. Thus the majority of samples were from symptom-free patients belonging to ‘low-risk’ groups. It also differs from the DH data in that our study included others outside

Table 3 Comparison of the prevalence of Chlamydia trachomatis infection in patients with or without genital tract symptoms at presentation^a

	Samples tested ^b (n)	Samples positive ^b (n)	Prevalence (%) (CI)	p
No GT symptoms females	12575	1107	8.8 (8.3–9.3)	
GT symptoms females	1183	163	13.8 (11.9–15.9)	< 0.0010
No GT symptoms males	644	63	9.8 (7.7–12.3)	
GT symptoms males	354	79	22.3 (18.1–27.0)	< 0.0001

^aData exclude contacts of positive individuals.
^bNumber of samples, not patients.
GT, Genital tract.

Figure 1 Number of specimens and prevalence of Chlamydia trachomatis versus age in females (excluding tests of cure)

Figure 2 Number of specimens and prevalence of Chlamydia trachomatis versus age in males (excluding tests of cure and contacts of positive individuals)

of the DH pilot, which was primarily aimed at screening females aged 16–24 years. Our data include the 12 864 samples from the DH study. The full report on the DH study, including acceptability, prevalence and management of opportunistic screening, is to be published elsewhere and details are available on the DH website.¹⁷

The overall prevalence of 9.6% and the prevalence for each of the various patient groups were higher than those found in previous studies. The higher sensitivity of the molecular method used, compared to enzyme immunoassay, is likely to account for the higher prevalence.¹⁸ A total of 93% of our study population were women and 93% were aged 16–24 years, therefore our overall prevalence of 9.6% may not reflect the overall prevalence of *C. trachomatis* in men and women of all ages within the UK.

The prevalence of genital chlamydia infection varies with both health care site attended and reason for attendance. The highest prevalence was obtained with samples from both men and women attending GUM clinics for sexual health screening and this confirms results from previous studies.⁵ The high prevalence in both TOP patients

and those attending for antenatal care supports routine screening of these women. *C. trachomatis* has been associated with spontaneous preterm birth¹⁹ and neonatal conjunctivitis and pneumonitis.²⁰ We found a higher prevalence in GP patients than obtained in previous studies.⁶ This resulted in a large number of positive individuals who were identified and treated and who would have remained undiagnosed if opportunistic screening in primary care had not been carried out. Only 58/654 (8.9%) positive individuals presented to their GP with genital tract symptoms.

The Sexual Health Strategy²¹ recently published by the DH recommends screening for genital *C. trachomatis* infection, initially, in selected groups such as those attending GUM, for TOP and for their first smear. A broader national programme may be implemented later. The overall prevalence of 9.6% indicates that opportunistic screening should be available to all women aged under 25 years. In addition, screening should be offered to men attending GUM and young people's clinics. However, this policy would have significant cost implications but DH data indicate that screening would be cost-effective after 3–5 years with a prevalence of 6%.⁵ Another option is selective screening of 'high-risk' groups. Our results suggest that these would include women attending GUM and young people's clinics, women attending for TOP and antenatal care, and all patients with symptoms suggestive of genital tract infection. These 'higher risk' women could then be screened on a regular basis although it is currently not known how often screening should be repeated. A further study is underway to try and determine the optimal frequency of screening. This DH-funded Re-infection Study began in Portsmouth and the Wirral in March 2002. Our study also shows that the positivity rate for females is highest at age 19 years and, therefore, an alternative approach to screening could be to offer a single opportunistic screening test to all women at approximately age 20 years, possibly at the time of the first cervical smear, and this would identify many infected women. However, many of these women could have had the infection for several years and already have serious sequelae by the time of their first smear.

Since men were only screened in GUM and Sex Sense clinics it is not possible from this study to draw any conclusions regarding selective screening of men in other settings.

In conclusion, based on the results of our study, we would recommend opportunistic screening for all women aged 16–24 years attending any health care site and men attending sexual health care settings.

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Competing interests. None identified.

References

- 1 PHLS, DHSS & PSS and the Scottish IDS(D)5 Collaborative Group. *Trends in sexually transmitted infections in the UK 1990–1999*. London: Public Health Laboratory Service (PHLS), 2000.
- 2 Department of Health. *Chlamydia trachomatis screening pilot: project initiative document* (20889 IP 300). London: Department of Health, March 2000 (CPL).
- 3 Svensson L, Mardh PP, Westrom L. Infertility after acute salpingitis with special reference to *Chlamydia trachomatis*. *Fertil Steril* 1983; **40**: 322–329.
- 4 Henry-Suchet J, Utzmann C, DeBrux J, et al. Microbiologic study of chronic inflammation associated with tubal infertility: role of *Chlamydia trachomatis*. *Fertil Steril* 1987; **47**: 274–277.
- 5 Chief Medical Officer (CMO). *Main report of the CMO's Expert Advisory Group on Chlamydia trachomatis*. London: Department of Health, 1998.
- 6 Grun L, Tassano-Smith J, Carder C, et al. Comparison of two methods of screening for genital chlamydia infection in women attending general practice: cross sectional survey. *BMJ* 1997; **315**(7102): 226–230.
- 7 Kirkwood K, Horn K, Glasier A, et al. Non-invasive screening of teenagers for *Chlamydia trachomatis* in a family planning setting. *Br J Fam Plann* 1999; **25**: 11–12.
- 8 Burstein GR, Gaydos CA, Diener-West PH, et al. Incident *Chlamydia trachomatis* infections among inner-city adolescent females. *JAMA* 1998; **280**(6): 521–526.
- 9 Stokes T. Screening for chlamydia in general practice: a literature review and summary of the evidence. *J Pub Health* 1997; **19**(2): 222–232.
- 10 Macmillan S, McKenzie H, Flett G, et al. Which women should be tested for *Chlamydia trachomatis*? *Br J Obstet Gynaecol* 2000; **107**(9): 1088–1093.
- 11 Skjeldestad FE, Nordbo SA, Hadgu A. Sentinel surveillance of *Chlamydia trachomatis* infection in women terminating pregnancy. *Genitourin Med* 1997; **73**: 29–32.
- 12 Fenton K, Korovessis C, Johnson A, et al. Sexual behaviour in Britain: reported sexually transmitted infections and prevalent genital *Chlamydia trachomatis* infection. *Lancet* 2001; **358**: 1851–1854.
- 13 Scholes D, Stergachis A, Heidrich F, et al. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. *N Engl J Med* 1996; **334**: 1362–1366.
- 14 Herrmann B, Johnsson A, Mardh PA. A retrospective study of efforts to diagnose infections by *Chlamydia trachomatis* in a Swedish county. *Sex Transm Dis* 1991; **18**: 233–237.
- 15 Addis DG, Vaughan ML, Ludka D, et al. Decreased prevalence of *Chlamydia trachomatis* infection associated with a selective programme in family planning clinics in Wisconsin. *Sex Transm Dis* 1993; **20**: 28–34.
- 16 Pimenta J, Catchpole M, Gray M, et al. Screening for genital chlamydia infection. *BMJ* 2000; **321**: 629–631.
- 17 Sexual Health and HIV Strategy: Chlamydia Screening Pilot: Report of 1999–2000 Study. www.doh.gov.uk/sexualhealthandhiv/chlamydscreenpilot.htm
- 18 Schepetiuk S, Kok T, Martin L, et al. Detection of *Chlamydia trachomatis* in urine samples by nucleic acid tests: comparison with culture and enzyme immunoassay of genital swab specimens. *J Clin Microbiol* 1997; **35**(12): 3355–3357.
- 19 Andrews WW, Goldenberg RL, Mercer B, et al. The Preterm Prediction Study: association of second-trimester genitourinary chlamydia infection with subsequent spontaneous preterm birth. *Am J Obstet Gynecol* 2000; **183**(3): 662–668.
- 20 Jain S. Perinatally acquired *Chlamydia trachomatis* associated morbidity in young infants. *J Matern Fetal Med* 1999; **8**: 130–133.
- 21 Department of Health. *The national strategy for sexual health and HIV*. London: Department of Health, July 2001.