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.

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 from samples from males and females attending genitourinary medicine, those with genital tract symptoms, and females attending 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 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 trachomatis6 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
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 Sense Sex attendees (12.1%). However, the number of samples tested from the 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

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

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 setting

<table>
<thead>
<tr>
<th>Reason for attendance</th>
<th>Samples tested (n)</th>
<th>Samples positive (n)</th>
<th>Prevalence (%) (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contraception</td>
<td>4692</td>
<td>434</td>
<td>9.2 (8.4–10.1)</td>
</tr>
<tr>
<td>Non-genital tract</td>
<td>3262</td>
<td>274</td>
<td>8.4 (7.5–9.4)</td>
</tr>
<tr>
<td>Chlamydia screening only</td>
<td>1260</td>
<td>132</td>
<td>10.5 (8.8–12.3)</td>
</tr>
<tr>
<td>TOP</td>
<td>411</td>
<td>52</td>
<td>12.7 (9.6–16.3)</td>
</tr>
<tr>
<td>Antenatal care</td>
<td>404</td>
<td>52</td>
<td>12.9 (9.8–16.5)</td>
</tr>
<tr>
<td>Genital tract symptoms</td>
<td>1302</td>
<td>192</td>
<td>16.0 (13.9–18.2)</td>
</tr>
<tr>
<td>STI screen (GUM) female</td>
<td>533</td>
<td>74</td>
<td>13.9 (11.1–17.1)</td>
</tr>
<tr>
<td>STI screen (GUM) male</td>
<td>295</td>
<td>28</td>
<td>9.5 (6.4–13.4)</td>
</tr>
<tr>
<td>Cervical smear</td>
<td>331</td>
<td>27</td>
<td>8.2 (5.4–11.6)</td>
</tr>
<tr>
<td>Other not stated</td>
<td>1614</td>
<td>94</td>
<td>5.8 (4.7–7.1)</td>
</tr>
<tr>
<td>Previous unsatisfactory test</td>
<td>633</td>
<td>46</td>
<td>7.3 (5.4–9.6)</td>
</tr>
<tr>
<td>Other genital tract</td>
<td>119</td>
<td>7</td>
<td>5.9 (2.4–11.7)</td>
</tr>
<tr>
<td>Total</td>
<td>14756</td>
<td>1412</td>
<td>9.6 (9.1–10.1)</td>
</tr>
</tbody>
</table>

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.

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

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

<table>
<thead>
<tr>
<th>Samples tested (n)</th>
<th>Samples positive (n)</th>
<th>Prevalence (%) (CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No GT symptoms females</td>
<td>12575</td>
<td>1107</td>
<td>8.8 (8.3–9.3)</td>
</tr>
<tr>
<td>GT symptoms females</td>
<td>1183</td>
<td>163</td>
<td>13.8 (11.9–15.9)</td>
</tr>
<tr>
<td>No GT symptoms males</td>
<td>644</td>
<td>63</td>
<td>9.8 (7.7–12.3)</td>
</tr>
<tr>
<td>GT symptoms males</td>
<td>354</td>
<td>79</td>
<td>22.3 (18.1–27.0)</td>
</tr>
</tbody>
</table>

aData exclude contacts of positive individuals.

bNumber of samples, not patients.

GT, Genital tract.
and those attending for antenatal care supports routine screening of these women. C. trachomatis has been associated with spontaneous preterm birth and neonatal conjunctivitis and pneumonitis. We found a higher prevalence in GP patients than obtained in previous studies. 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 Strategy 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%. 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.

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