Coverage and uptake of systematic postal screening for genital *Chlamydia trachomatis* and prevalence of infection in the United Kingdom general population: cross sectional study

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Abstract

Objective To measure the coverage and uptake of systematic postal screening for genital *Chlamydia trachomatis* and the prevalence of infection in the general population in the United Kingdom. To investigate factors associated with these measures.
Design Cross sectional survey of people randomly selected from general practice registers. Invitation to provide a specimen collected at home.
Setting England.
Participants 19 773 men and women aged 16-39 years invited to participate in screening.
Main outcome measures Coverage and uptake of screening; prevalence of chlamydia.
Results Coverage of chlamydia screening was 73% and was lower in areas with a higher proportion of non-white residents. Uptake in 16-24 year olds was 31.5% and was lower in men, younger adults, and practices in disadvantaged areas. Overall prevalence of chlamydia was 2.8% (95% confidence interval 2.2% to 3.4%) in men and 3.6% (3.1% to 4.9%) in women, but it was higher in people younger than 25 years (men 5.1%; 4.0% to 6.3%; women 6.2%; 5.2% to 7.8%). Prevalence was higher in the subgroup of younger women who were harder to engage in screening. The strongest determinant of chlamydial infection was having one or more new sexual partners in the past year.
Conclusions Postal chlamydia screening was feasible, but coverage was incomplete and uptake was modest. Lower coverage of postal screening in areas with more non-white residents along with poorer uptake in more deprived areas and among women at higher risk of infection could mean that screening leads to wider inequalities in sexual health.

Introduction

Randomised trials show that systematic screening for genital *Chlamydia trachomatis* might reduce the incidence of pelvic inflammatory disease by about 50%.[1] We investigated the coverage and uptake of systematic chlamydia screening by post, estimated prevalence of chlamydia, and explored factors associated with these measures.

Methods

The chlamydia screening studies (ClaSS) project has been described previously,[2] and the full protocol is available at www.chlamydia.ac.uk.

We invited men and women aged 16-39, randomly selected from 27 general practices in the West Midlands and Avon, to collect their own specimens (urine in men, urine and vulvovaginal swab in women) and post them to us, and to complete a questionnaire on risk factors. Invitations and testing kits went to patients' registered address, and we confirmed residence at this address. We used postal reminders, telephone calls, home visits, and "flagging" of records at study practices to encourage participation.

Our colleagues in the reference laboratory (SS and AHe) used nucleic acid amplification tests to detect *C trachomatis* and confirmed positive results. Postal delays did not affect positivity rates (data not shown). Participants with chlamydia received results and treatment at their practice. Notification of partners was undertaken at either the practice or a genitourinary clinic. Statistical analyses of coverage of chlamydia screening (proportion receiving an invitation to be screened), uptake (proportion returning a specimen), and prevalence took into account clustering at the practice level and sampling probability.

Results

Of 19 773 people aged 16-39 who had been invited, 73% (14 382, see bmj.com) were successfully contacted. Uptake of screening was 34.5% (95% confidence inter-

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val 31.2% to 38.0%) overall, and 31.5% (28.6% to 34.6%) in 16-24 year olds (table 1). After a single postal invitation, uptake was 22.2% (18.6% to 26.2%) in 16-24 year olds and was higher in women than men (table 1). A postal reminder and face to face contact (in a home visit, or "flagged" patients being invited to participate when they attended their practice) each increased uptake by around 5%. Screening coverage and uptake varied by practice (see table A on bmj.com). Coverage was lower in areas with higher proportions of residents from minority ethnic groups, and uptake was lower in practices with higher deprivation scores (see table B on bmj.com).

The overall prevalence of chlamydia was 2.8% (2.2% to 3.4%) in men and 3.6% (3.1% to 4.9%) in women, but it was higher in people who were younger than 25 (men 5.1%, 4.0% to 6.3%), women 6.2%, 5.2% to 7.8%). Prevalence was below 1% in men older than 24 and women older than 29 years. Prevalence was higher among the subgroup of 16-24 year old women who only participated after repeated contacts (table 1). Having one or more new partners in the past 12 months was the strongest predictor of infection (table 2). The prevalence of chlamydia was also higher in single compared with married women and in men aged 20-24 than in people aged 16-19 years (tables C and D on bmj.com).

Prevalence did not vary substantially between practices ($I^2 = 34\%$ of variation attributable to heterogeneity between practices, tables A, C, and D on bmj.com). We found weak evidence that chlamydia was more common in practices in more deprived areas (adjusted odds ratio for a 10 point increase in deprivation score, 1.2, 1.0 to 1.4, $P = 0.077$).

Discussion

A single round of systematic, postal screening for chlamydia was feasible, but coverage was incomplete and uptake was modest, particularly in more deprived areas. The prevalence of chlamydia was 5-6% in men and women younger than 25. Having one or more new sexual partners in the past year was the strongest determinant of infection. In young women the risk of chlamydia was higher among those who were harder to engage in screening.

Strengths and limitations of the study

The strengths of this study are that it was large, population based, included both men and women, and tested a screening strategy shown to be feasible and effective in other settings.[3] Limitations were that screening coverage was incomplete, reflecting inaccuracies in practice lists, and uptake was lower than expected,[4] so the power of the study was reduced and prevalence estimates might be affected by selection bias.[5] Repeated reminders had little impact on increasing uptake and would be unfeasible in routine practice.

Comparison with other studies

Our estimates of chlamydia prevalence were broadly comparable with other population based studies showing that 2-6% of men and women under the age of 25 are infected.[1 3 6] The variability might reflect differences in study populations or selection biases since participation in all studies was incomplete.

Meaning of the study

Chlamydia risk was most strongly associated with having a new sexual partner in the past year, rather than the total number of partners. Although being from a black minority ethnic group has been found to be associated with chlamydia,[7] we did not find a strong association with ethnicity. Our findings indicate that chlamydia screening should be offered to all men and women under 25 years because selection based on sexual behaviour could be difficult.

Effectiveness of chlamydia screening

Opportunistic chlamydia screening in selected settings, focusing on women younger than 25 is now being introduced in England,[8] even though this approach has not been evaluated in randomised trials[1] and has not controlled transmission of chlamydia in Sweden.[1] In contrast, randomised trials in Denmark have found

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Table 1 Uptake of screening and prevalence of chlamydia according to effort needed to secure participation

Groups by sex and age	Effort needed	No of people who received this form of invitation to be screened	No of people who responded after each form of invitation*	% uptake (95% CI)	% cumulative uptake (95% CI)	No of cases	Prevalence (95% CI)	P value for linear trend calculated from Wald test	Cumulative prevalence (95% CI)
All	Single postal invitation	14 382	3239	25.0 (21.7 to 28.6)	25.0 (21.7 to 28.6)	137	3.0 (2.3 to 3.9)	0.014	3.0 (2.3 to 3.9)
	Two postal invitations	11 143	683	5.3 (3.9 to 7.1)	30.3 (26.5 to 34.3)	32	3.4 (2.1 to 5.4)		3.1 (2.3 to 4.0)
	Phone call	10 460	53	0.5 (0.1 to 2.2)	30.8 (26.9 to 35.0)	2	2.0 (1.1 to 3.8)		3.0 (2.3 to 3.9)
	Home visit or flagging†	10 407	765	3.7 (2.0 to 6.8)	34.5 (31.2 to 38.0)	48	5.0 (3.4 to 7.2)		3.2 (2.5 to 4.2)
All 16-24	Single postal invitation	11 245	2436	22.2 (18.6 to 26.2)	22.2 (18.6 to 26.2)	133	5.4 (4.3 to 6.6)	0.054	5.4 (4.3 to 6.6)
	Two postal invitations	8809	507	4.3 (3.0 to 6.2)	26.5 (22.6 to 30.8)	29	6.5 (4.7 to 8.9)		5.5 (4.6 to 6.7)
	Phone call	8302	39	0.5 (0.1 to 2.2)	27.0 (22.9 to 31.5)	2	4.4 (2.8 to 6.8)		5.5 (4.6 to 6.7)
	Home visit or flagging†	8263	627	4.6 (2.0 to 10.0)	31.5 (28.6 to 34.6)	45	7.4 (5.5 to 9.9)		5.8 (4.9 to 6.9)
Men 16-24	Single postal invitation	5454	1017	18.9 (16.0 to 22.3)	18.9 (16.0 to 22.3)	46	5.4 (4.4 to 6.5)	0.768	5.4 (4.4 to 6.5)
	Two postal invitations	4437	196	3.57 (2.6 to 4.9)	22.5 (19.3 to 26.1)	9	5.3 (2.8 to 9.8)		5.4 (4.3 to 6.6)
	Phone call	2241	21	0.49 (0.1 to 2.5)	23.0 (19.6 to 26.8)	0	0.0 (0.0 to 0.1)		5.2 (4.2 to 6.5)
	Home visit or flagging†	4220	243	3.61 (1.5 to 8.3)	26.6 (24.0 to 29.4)	12	5.4 (3.3 to 8.8)		5.3 (4.4 to 6.3)
Women 16-24	Single postal invitation	5791	1419	25.3 (20.9 to 30.3)	25.3 (20.9 to 30.3)	76	5.3 (3.9 to 7.3)	0.033	5.3 (3.9 to 7.3)
	Two postal invitations	4372	311	5.1 (3.4 to 7.7)	30.4 (25.7 to 35.6)	20	7.3 (4.8 to 11.0)		5.7 (4.3 to 7.5)
	Phone call	4061	18	0.4 (0.1 to 2.0)	30.9 (26.0 to 36.2)	2	9.5 (5.8 to 15.2)		5.7 (4.4 to 7.4)
	Home visit or flagging†	4043	384	5.5 (2.5 to 11.9)	36.4 (33.1 to 39.8)	33	8.7 (6.8 to 11.1)		6.2 (4.9 to 7.8)

*Includes nine people who returned a consent form but no specimen.
†A "flag" was attached to patients' notes. Patients attending the practice during the study period were invited again to take part if they had not already participated, declined to participate, or been confirmed not resident at their address.

Table 2 Prevalence of infection according to number of sexual partners, and association between prevalence and sexual behaviour, in men and women

Variable	Group	No of participants*	No of cases	Prevalence†	Odds ratio (95% CI) Crude	Odds ratio (95% CI) Adjusted‡	P value‡	Adjusted odds ratio (95% CI)§	P value§
Total partners	0/1	941	38	4.1 (3.0 to 7.0)	1 (reference)	1 (reference)	0.018	1 (reference)	0.149
	2	226	15	8.8 (5.4 to 13.4)	2.3 (1.1 to 4.7)	2.0 (1.0 to 4.0)		1.0 (0.4 to 2.4)	
	3	139	15	11.7 (7.2 to 15.5)	3.1 (1.5 to 6.3)	2.9 (1.4 to 6.2)		1.6 (0.7 to 3.8)	
	4 or more	200	27	12.5 (8.7 to 18.6)	3.3 (1.5 to 7.3)	3.0 (1.4 to 6.5)		1.9 (0.9 to 4.2)	
New partners¶	0	697	23	2.9 (1.9 to 5.7)	1 (reference)	1 (reference)	<0.001	1 (reference)	<0.001
	1	417	24	7.4 (5.0 to 11.1)	2.7 (1.3 to 5.5)	2.7 (1.3 to 5.6)		2.6 (1.4 to 4.8)	
	2	166	21	13.9 (9.3 to 20.7)	5.5 (2.7 to 11.2)	5.1 (2.5 to 10.3)		4.2 (2.0 to 9.1)	
	3 or more	226	27	11.0 (7.7 to 15.6)	4.2 (1.8 to 10.1)	4.1 (1.7 to 9.9)		2.4 (1.1 to 5.3)	

*Logistic regression models include 1506 people aged 16-24 who had ever had sex and who responded to questions about numbers of sexual partners.
†Prevalence weighted for selection probability and adjusted for clustering at practice level by using inverse probability weights and robust standard errors.
‡From model additionally adjusted for age, marital status, and ethnic group.
§From model additionally adjusted for age, marital status, and ethnic group and both sexual behaviour variables.
¶Number of new sexual partners in the past year.

postal screening, with uptake similar to this study, to be effective and cost effective.[9] The cost effectiveness of postal chlamydia screening in the ClaSS project will be reported separately. If postal screening were introduced, publicity and increasing familiarity may lead to higher uptake. Postal screening could also have a role as an adjunct to opportunistic screening since we also found that we reached a proportion of individuals who had not visited their practice in the past year.[10]

Effective health technology can contribute to widening health inequalities if access to care varies with social position. We found lower coverage of chlamydia screening in areas with more residents from minority ethnic groups, lower uptake in more deprived areas, and a trend towards higher prevalence in more deprived areas. Additionally, young women with the highest prevalence of chlamydia participated only after repeated invitations. Further research is needed to clarify the impact of chlamydia screening on sexual health inequalities.

What is already known

Rates of infection with genital *Chlamydia trachomatis* are increasing across Europe and in the United States

Opportunistic chlamydia screening is being introduced in England, although there is no high quality evidence of its effectiveness

Systematic population screening for chlamydia has been shown to be effective but factors affecting the coverage and uptake are poorly understood

What this study adds

Postal screening was feasible, but coverage and uptake were incomplete

Young women at higher risk of infection were harder to engage in screening

Undiagnosed chlamydia is common in both men and women under the age of 25 in the general population

An age younger than 25 and having a recent new sexual partner were the only important risk factors for chlamydia identified

Conclusion

Evidence for the long term effectiveness and impact of chlamydia screening programmes remains limited.[1] Randomised trials to determine the most effective strategy are required. In England these could be incorporated within the phased introduction of the national screening programme.

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Endpiece

Medicine: science or art?

If there were no individual variability, medicine would have been science not an art.

Sir William Osler

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