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Risk factors for *Chlamydia trachomatis* infection among users of an Internet-based testing service in Sweden

Masuma Novak [a], Daniel Novak [b,*]

[a] Department of Molecular and Clinical Medicine, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[b] Department of Paediatrics, Queen Silvia Children's Hospital, The Sahlgrenska Academy, University of Gothenburg, SE-416 85 Gothenburg, Sweden

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ABSTRACT

Objective: This study aims to assess potential risk factors for *Chlamydia trachomatis* infection among users of an Internet-based testing service in Sweden.
Method: Users of an Internet-based *C. trachomatis* testing service sent in home urine samples by post which were analysed for *C. trachomatis* and answered a questionnaire regarding their socio-demographic background, sexual risk behaviour, and sexual health. Potential risk factors for *C. trachomatis* were determined by logistic regression models.
Results: The questionnaire response rate was 86% (6025/6978) with a male and female response rate of 77% and 93%, respectively. 5763 subjects both answered questionnaire and supplied urine sample. Mean age was 24.4 years (range 15–67 years) and 62% were women. The participants' *C. trachomatis* prevalence in men was 8.0% (73/2163) and 5.6% in women (201/3600). Compared to non-infected individuals, the *C. trachomatis* infected men and women were younger, had a higher number of sexual partners, more intercourse without condom (only men). After adjusting for age, civil status, and geographical region, the risk factors significantly associated with *C. trachomatis* infection were multiple partners during the previous year, non-condom usage, and having symptoms (only men). A novel finding was that, in women, believing to be infected and having been requested to be tested by a sexual partner, was associated with an increased risk of having a *C. trachomatis* infection.
Conclusion: The Internet-based *C. trachomatis* testing service reaches a risk group of men and women. The results emphasise the value of self-risk assessment for *C. trachomatis* infection and the importance of easy accessible and simple sexual transmitted infection testing services.

Introduction

Chlamydia trachomatis is the most frequently reported sexually transmitted infection in Europe [1] and being mostly asymptomatic it poses a challenge to both primary and secondary prevention. New strategies to increase the *C. trachomatis* testing coverage by offering home testing with the help of the Internet has been proven to be a feasible and acceptable testing method in both low [2] and high income settings [3]. This Internet-based STI testing services are quickly emerging worldwide where some are publicly funded and offer free testing while others may be expensive and not regulated [4,5]. Internet-based *C. trachomatis* testing has been suggested [6,7] and has also recently been used for systematic large scale *C. trachomatis* screening [7,8]. Although this method may seem like a convenient and appealing testing alternative to young adults, there are also risks and disadvantages. The disadvantages are the lack of individualised care including the lack of individualised information, counselling, and appropriate STI testing and management. The risks are that it is a relatively new testing strategy and that little is yet known about the users of Internet-based testing services.

Sweden was the first country to introduce home testing for *C. trachomatis* with the help of the Internet for both men and women in 2004 [9]. Since the introduction in the county of Västerbotten it is now available for free to over half the Swedish population. A previous study exploring the characteristics of this Internet home-testing of *C. trachomatis* service users showed that they had higher frequency of previous STIs compared to other Swedish Internet users and engaged in high sexual risk behaviour [10]. However, little is known about the individuals who test positive for *C. trachomatis* by this method. This article investigates the prevalence of *C. trachomatis* and the risk factors for *C. trachomatis* infection among individuals using an Internet-based testing service in Sweden.

Method

The study took place in the county of Västerbotten, Sweden. The county of Västerbotten is a sparsely populated region in the north

* Corresponding author. Tel.: +46 31 3438072; fax: +46 31 843010.
E-mail address: daniel.novak@vgregion.se (D. Novak).

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of Sweden with 212,000 inhabitants (2.5% of the total Swedish population), which compromises 13% of the Swedish total area. There are three big cities in Västerbotten (Umeå, Skellefteå, Lycksele) where 73% of the population lives. Umeå is the largest city (115,000 inhabitants) hosting a University, multiple health centres, one STD clinic for all ages, and one Youth Health Clinic for boys and girls <23 years of age. Skellefteå is an industrial city (32,000 inhabitants) with multiple health centres and one Youth Health Clinic for boys <26 years of age and girls <21 years of age. Lycksele has 8000 inhabitants with multiple health centres and one Youth Health Clinic for boys and girls <23 years of age. Residents can get tested for *C. trachomatis* at every health clinic in the county.

As a complement to the regular in-clinic *C. trachomatis* testing, the county hosts a website which allows residents over the age of 15 to request a *C. trachomatis* home test. Residents can enter their personal civic number and postal address on the website and a test kit is sent to them. These kits are provided as part of the publicly funded health care system. Orders are stored in a data base. Test kits included instructions, a personally coded urine specimen container, laboratory requisition slip, and a questionnaire asking about demographic background, sexual risk behaviour and sexual health (such as previous STIS and reasons for testing). Urine samples, the lab requisition slip and questionnaire were sent by mail in a preaddressed envelop to the laboratory and were analysed according to standard lab procedures. Participants retrieved results from the county's Internet website with their personal codes. Infected individuals sought treatment independently by printing out a physician referral sheet and the physician confirmed that treatment had begun by a letter to us.

Questionnaires were sent out during three consecutive years, 2005–2007. Participants were informed that answering the questionnaire was voluntary and that their decision would not alter the testing procedure. The local medical ethics committee approved the study. The questionnaire was constructed mainly using questions from previously validated questionnaires [9,11]. The reliability of the questionnaire was satisfactory [9]. Questions about sexual risk behaviour focused on number of sexual partners, condom use, previous STIs, and reason for testing. Questions regarding their socio-demographic background included age, civil status, education and residential area.

Statistical methods

Differences in the distribution of socio-demographic profiles, sexual risk behaviours, previous STIs and reason for testing in men and women infected with *C. trachomatis* versus non-infected were examined using Chi-square tests for categorical variables and Student's *t* tests for continuous variables. All *p*-values were two-tailed and values <0.05 were considered significant. The associations of socio-demographic profiles as well as sexual health related factors with *C. trachomatis* were assessed by means of binary logistic regressions, where *C. trachomatis* positive was entered as a dependent variable. All regression analyses were repeated after controlling for age, education, civil status and region in multivariate regression models. Estimates derived from these models are expressed as odd ratios (ORs) and 95% confidence intervals (CIs). All the analyses were carried out separately for men and women. Statistical analyses were performed using SPSS, Windows version 18.0 (SPSS Inc., Chicago, IL, USA).

Results

A total of 9360 orders were made during the 3 year period (5498 from women and 3938 from men). Of these orders 6978 urine samples were returned for analysis (4055 from women and 2923 from men). 6025 questionnaires were received together with the urine samples. The total questionnaire response rate was 86% (6025/6978) where the response rate among men was 77% (2256/2923) and 93% (3769/4055) among women. Among these 6025 subjects we had to exclude 262 (169 women and 93 men) subjects due to unavailable *C. trachomatis* test results. The present study sample therefore consists of 38% (2163/5763) men and 62% (3600/5763) women who answered questionnaires and who also had complete *C. trachomatis* test results.

The mean age for men was 25.4 (range 15–67) and for women 23.7 (range 15–54) years. The *C. trachomatis* prevalence among men was 8.0% (173/2163) and among women 5.6% (201/3600). Table 1 presents the differences between *C. trachomatis* positive and negative individuals with regards to reasons for testing, their socio-economic profiles, sexual health, and their sexual risk behaviour. In comparison between *C. trachomatis* infected and non-infected individuals the infected men and women were younger, had a higher number of sexual partners, had more intercourses without a condom with an unknown person (only men), had symptoms (only men), believed to be infected, or their partner had suggested they get tested (only women).

Table 2 presents the odds ratios of *C. trachomatis* positive according to test reason, sexual health, and sexual risk behaviour among men and women. Having symptoms, believing to be infected, and having two or more sexual partners during the previous year were associated with *C. trachomatis* infection among men (Table 2). For example, the risk of being infected with *C. trachomatis* was three times higher among men who believed themselves to be infected (adjusted OR 3.00 CI: 2.14–4.19). Among women, being requested by their partner to test, believing to be infected, and having two or more sexual partners during the previous year were associated with the risk of *C. trachomatis* infection (Table 2). For example, women whose male partner had requested they get tested had approximately a three times higher risk of being infected with *C. trachomatis* than women whose partners did not request them to get tested (adjusted OR 2.62 CI: 1.57–4.40). More men (18%) than women (5.7%) were requested by their partner to test themselves (not shown in Table).

Discussion

This study investigated the risk factors associated with *C. trachomatis* infection among users of an Internet-based STI testing service funded and hosted by Västerbotten County in Sweden. The Internet-based STI testing service was not part of a screening strategy but serves as a complement to regular clinical testing, where participants made their own risk assessment before ordering a Chlamydia testing kit.

Socio-demographic background and reasons for testing

The Internet testing service appealed to younger single city people where over 70% were single, were 25 years and younger, and lived in the largest city Umeå (data not shown). Our results also indicate that the level of education is lower among men and women with *C. trachomatis* infection than non-infected. Education could however be related to age because infected men and women were younger than non-infected participants. The association between low education and risk of STIs has been shown in previous studies [12,13] but whether this is also true for persons who use Internet based *C. trachomatis* tests is not known. More detail analysis of socioeconomic status and *C. trachomatis* infection will be analysed in upcoming work.