

# Chlamydia trachomatis infection in a Swiss prison: a cross sectional study

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## Summary

**BACKGROUND:** Chlamydia trachomatis infection (CTI) is the most frequent sexually transmitted infection in Switzerland and its prevalence in correctional settings is currently unknown. The aim of this study was to determine the prevalence of CTI and associated risk factors in a population of inmates aged 18–35 years.

**METHODS:** Inmates attending the health care unit of the largest Swiss remand prison from June 2008 to May 2009 were invited to participate in this cross-sectional study. All participants completed a questionnaire and provided a first-void urine specimen for CTI testing based on a PCR assay. Univariate and multivariate logistic regression analyses were used to assess risk factors associated with CTI.

**RESULTS:** 214 male and 20 female inmates agreed to participate. Overall CTI prevalence was 6.5% in men (95% CI 3.2; 9.9) and 10% (95%CI 0; 23.1) in women. None of the following possible risk factors analysed were significantly correlated to CTI: age, origin, education, religion, number of sexual partners, iv drug use, subjective health status and uro-genital symptoms.

**CONCLUSION:** CTI prevalence in the largest Swiss prison was two to six times higher than in the general population but similar to other European prison settings. This result should raise our awareness that this population is at particularly high risk for sexually transmitted infections and motivate a widespread surveillance of prison CT prevalence. We hesitate to consider systematic screening because evidence is still lacking in relation to the benefits of screening in males. Local cost effectiveness studies would

highly contribute to a correct decision concerning implementation of screening.

**Key words:** Chlamydia trachomatis infection; jail; prison; risk factors; prevalence; STI

## Introduction

Chlamydia trachomatis infection (CTI) is the most frequently diagnosed bacterial agent of sexually transmitted infections (STI) in both men and women in the Western world. The exact burden of this infection remains unknown as an important proportion of CTI is not diagnosed and reported [1]. Undiagnosed infections are a real challenge as untreated disease leaves patients at risk of developing complications such as sterility, ectopic pregnancy, inflammatory pelvic disease and orchitis.

In the USA, CTI prevalence in the general population ranges between 1 and 10.3% [2–4]. Similar results are found in the UK [5]. In Switzerland, there are no population studies on CTI prevalence. CTI reporting is mandatory and recent data show an increasing incidence [6]. Abraham reported that CTI notification in Geneva had increased by 46% between 1999 and 2004 [7]. Studies in specific populations found a 2.8% prevalence in sexually active women in 1998 and of 1.3% among Swiss army recruits (18–26 years old) [8].

In correctional settings in the USA, CTI prevalence rates were shown to be as high as 21% among females under 25 years of age and 18% in African-American males [9, 10]. Nevertheless, prevalence varies widely (as in the general population), with rates below 4% in a study including inmates 18–35 years [11]. To the best of our knowledge, no data exists to describe the situation in Swiss prisons.

The risk of acquiring CTI is associated with socio-demographic and behavioural factors. Studies have shown that being non-white and having a lower educational level significantly increased the risk of CTI [12–15]. Women under the age of 25, non-white individuals and people with new or multiple sex partners are considered at increased risk in the USA [2]. Risk of infection is more likely in individuals who have had their last medical visit more than

6 months ago [16]. Inmates are considered as a population with increased risk for many infectious diseases in relation to health compromising behaviours (no condom use, multiple sex partners, iv drug use, unstable partnership due to incarceration) and promiscuity related to incarceration [17, 18].

On the basis of studies showing a significant reduction in poor health outcomes following treatment of Chlamydia trachomatis (CT) positive cases, American and British recommendations favour screening of all asymptomatic sexually active or pregnant women at increased risk [19, 20]. Data are lacking to provide evidence based recommendations for males [2]. Though, specific data examining impact of screening for CT in jail found a decline in infection incidence in the female community surrounding jails where screening was organised [21].

The aim of this study was to measure the prevalence of CTI and to assess associated risk factors in a representative sample of inmates from Switzerland's largest prison in Geneva in order to inform the need for screening programmes in correctional settings in the future.

## Methods

### Setting

This cross-sectional study took place in Switzerland's largest remand prison in Geneva. Approximately 2400 men and 200 women are admitted to this facility each year (occupancy rate 169% in 2008). At the time the study took place, between 10 to 20% of inmates were sentenced prisoners waiting to be transferred to another institution. The medical unit is affiliated with the Geneva University Hospitals and independent from the prison administration. It offers a low threshold primary care approach to health care and is composed of general practitioners, nurses, psychiatrists, psychologists and dentists. All detainees admitted to the facility are submitted to a health care assessment by primary health care nurses within 12 hours of their admission. This evaluation acts as triage. Any identified health problem will be referred as soon as needed to the attending physicians. The medical team is available 24h a day, 7 days a week for emergencies. Prisoners can obtain a medical consultation at any time during their incarceration via letters, social service or prison administration within the regular opening hours of the medical consultation (8h–17h).

### Participants and procedure

Prisoners attending the Medical Care Unit between June 2008 and May 2009 were invited to participate. To ensure that clinical priorities could maintain precedence over the study, recruitment times varied according to the availability of medical staff. All study subjects were recruited during the regular consultation times (8h to 17h).

Following informed consent, participants completed a questionnaire and provided a first-void urine sample. Inclusion criteria were capacity for providing formal consent and age between 18 and 35 years. This age range permitted the inclusion of approximately 85% of inmates as the average age in this facility is 29 years. Exclusion criteria were absence of legal competency or inability to under-

stand French, English, Spanish, Arabic, Russian or Albanian. Questionnaires were available in the above mentioned languages and translated by professional translators. A general practitioner was present to help inmates to complete the questionnaire in case of illiteracy. The questions covered the following themes: sociodemographic factors, subjective health status, previous STI, antibiotic use during last three months, uro-genital symptoms during preceding week, iv drug use.

### Chlamydia testing and treatment

Real-time PCR detection for CTI was performed with the Abbott CT/NG reagents on a m2000 platform (Abbott Molecular Diagnostics, Des Plaines, IL). This assay is designed to detect the cryptic plasmid of *C. trachomatis*; the interpretation of the results was made according to the CE (European Conformity) package insert. Positive cases were offered antibiotic treatment within the medical unit (single dose of azithromycin 1 gram orally).

### Sample size calculation

From previous publications, we estimated a likely prevalence of CTI no higher than 10% in men and 15% in women [9–11]. To measure such prevalence rates with a standard error no larger than 3%, we calculated that a sample size of 142 men and 100 women would be necessary.

A reorganisation of the prison drastically reduced the number of female detainees admitted since September 2008. Thus, our target population of women could not be reached within the time frame of the study. In compensation, we decided to increase the sample size of men to be included in the study in order to provide more precise prevalence estimates for males.

### Statistical analysis

In order to investigate the relationship between CTI and possible predictive factors, we first used 2x2 tables and performed Chi-square and Fisher's exact tests to compare proportions for categorical variables and unpaired Student's t-tests to compare means for continuous variables. Multivariate logistic regression analyses were then used to explore the association of risk factors associated with CTI, adjusting for age, sex. The level of statistical significance was set at  $p < 0.05$ . All analyses were performed using SPSS for Windows (version 15.0). Missing data for each variable are mentioned in the tables.

### Ethical considerations

All inmates gave written informed consent. The study was approved by the ethical research committee of the Geneva University Hospitals (no 08-063).

## Results

Of 292 detainees invited to participate in the study, 37 (34 men) declined (12.7%) and 255 agreed (87.3%), among whom 21 (18 men) did not complete the questionnaire or did not provide a urine sample despite giving consent. Finally, 234 (80.1% of invited participants) inmates were included in the study. Those who declined participation or

did not complete the data were similar to participants in terms of age, sex and origin.

### Socio-demographic characteristics

214 men (91.5%) and 20 women (8.5%) participated in the study. Mean age was 26.4 years, (SD 4.6, range 18–35). The majority (94.9%) was non-Swiss (31.5% Europeans, 49.5% Africans and 15.3% Asians, mainly from Caucasus and 3.6% Americans).

35.7% had a primary school or lower educational level. 31.9% had been living less than one year in Switzerland and 63.3% 3 years or less in Switzerland or another European country.

No socio-demographic differences were found between CTI positive and CTI negative individuals.

### Health related aspects

Self-rated health status was declared poor or very poor by 19.7% of study subjects, good by 51.1% and very good or excellent by 29.2%. 6.4% had had an antibiotic treatment during the previous three months. At time of screening, 32.5% had any type of low abdominal or uro-genital complaints. 14.6% were active or former iv drug-users. We found no differences between infected and non infected participants.

### Chlamydia trachomatis infection (CTI)

CTI was found in 14 of 214 males (prevalence 6.5%, 95% CI 3.2–9.9) and in 2 of 20 females (10%; 95% CI 0–23.1). Table 1 shows the relationship between participant characteristics and risk of CTI. None of these factors were significantly associated with an increased CTI risk. When selecting male inmates, no significant statistical difference in CTI prevalence was observed among those 18–26 years compared those older than 26 (7.4% vs. 5.7%,  $p = 0.60$ ).

### Clinical follow-up

All patients with CTI received antibiotic treatment. No treatment side-effects were reported.

### Discussion

This study shows a CTI prevalence of 6.5% among males and 10% among females in Switzerland's largest prison. This result is within the range of those found in corresponding prison settings in France, UK and USA where the prevalence measured varied between 3.9% and 21% [9–11, 22–28].

The prevalence of CTI was comparable with those previously reported in the general population of persons under age 35 in Western countries, where prevalences between 1 and 10% were found [1, 2, 4, 5, 8, 19]. A recent study among male Swiss army recruits aged 18–26 years found a prevalence of 1.2%. Among this group, those living in urban settings had a higher prevalence of CTI (2, 9%) [8]. Comparing our results to the latter study, inmates had a six fold risk of being infected.

Our study did not find significant socio-demographic, behavioural and symptomatic differences between subjects with and without CTI confirming previous observations made in a similar settings in France but contrasts with studies in the general population [22, 29–31]. The size of the sample might have been too small to identify significant risk factors. However, we believe that it is more probably that this highly selected population shares different and more powerful risk factors. Being imprisoned and being a recently immigrated migrant (most probably associated with a new partnership) might be a decisive element. This hypothesis is also suggested by Buffardi, who points out that socio-economic conditions such as housing insecurity and being arrested are most consistently associated with exposition to a high risk environment [32]. Little access to care may be another common denominator in this popu-

**Table 1:** Frequencies of potential risk factors and unadjusted and adjusted odds ratios (OR) of Chlamydia trachomatis infection (CTI) in a prison setting, Geneva, Switzerland, 2008.

	Prevalence of Chlamydia trachomatis infection (CTI) n (%)	Missing values n	Adjusted OR for CTI * (95%CI)
Age			
≤25 years	9/103 (8.7)	0	1.7 (0.6;4.8)
>25 years	7/131 (5.3)		
Gender			
Women	2/20 (10)	0	1.6 (0.3;7.8)
Men	14/214 (6.5)		
Education			
Primary school or less	6/82 (7.3)	19	1.0 (0.3;3.1)
Higher than primary school	9/133 (6.8)		
Origin			
Africa	9/110 (8.2)	10	1.6 (0.5;4.4)
Other	7/124 (5.6)		
IV drug use (lifetime)			
Yes	1/34 (2.9)	1	0.4 (0.05;3.3)
No	15/199 (7.5)		
Uro-genital complaints			
Present	7/74 (9.5)	6	2.7 (0.9;8.6)
Absent	6/154 (3.9)		
Number of sexual partners last year			
1 or less	7/109 (6.4)	6	1.3 (0.5;3.8)
2 or more	9/119 (7.6)		

\* Adjustment for age and sex; adjusted results were similar to unadjusted (not shown)

lation, which includes a high proportion of undocumented migrants without insurance coverage [16].

Urogenital or abdominal complaints were reported by 32.5% of the subjects. On the other hand, 46.2% infected subjects did not have any symptoms. Screening symptomatic individuals only would have missed 6 out of 13. Therefore, and in contradiction with previous reports, symptom based screening would not be efficient in this custodial setting [3, 24, 33].

Our study is important because it presents the first CTI prevalence data in a sample of inmates of a Swiss prison. The high participation rate, despite the fact that the topic is sensitive, shows that research in a prison setting is possible, even if it remains difficult. Culturally sensitive approaches and non stigmatising attitudes favoured acceptance and participation in the study. Similar strategies have already been shown to be efficient elsewhere and should be promoted [34].

In light of the small sample of CTI positive prisoners our study had limited power in regard to the identification of risk factors. Estimates for women were imprecise due to the small sample size. Another limitation concerns the validity of the answers in relation to sensitive topics such as sexual behaviour. As patients with low literacy levels could not complete the questionnaire confidentially (the questions were read out to them) this may have biased their responses to sensitive questions. Nevertheless, when comparing inmates who accepted with those who declined no difference could be detected concerning age, sex and origin. When comparing our sample with the total population of our custodial setting, we can consider our sample as representative in terms of age, sex and origin [35].

We can consider our group at risk and as a reservoir for CTI. Should we screen them? We would expect an individual benefit as prison offers access to health care in an otherwise deprived population. An ecological study examining impact of screening men for CT in jail found a decline of incidence in the female community surrounding jails where screening was organised [21]. Therefore we support a large access to high quality curative and preventive care during the incarceration. Although it would be difficult to measure community benefit of systematic screening in this highly mobile community (mainly undocumented migrants) where follow up of cases would be very difficult. Cost effectiveness is another important point to be examined before implementing a screening. Some studies in US jails found screening of males <30 years old to be cost effective if partners could be notified, but this result was not reproduced elsewhere [36, 37]. Precise data should be determined regarding the local cost and prevalence in order to make a correct decision.

## Conclusions

In our setting, we found a prevalence of 6.5% of CTI among male inmates, which is two- to six-fold higher than in the general Swiss population but similar to other European prison settings. This result should raise our awareness that this population is at particularly risk for sexually transmitted infections and motivate a widespread surveillance of prison CT prevalence. We hesitate to con-

sider systematic screening because evidence is still lacking in relation to the benefits of screening in males. Local cost effectiveness studies would highly contribute to correct decision making concerning the implementation of screening.

The authors would like to thank the medical and nurses' team from Champ-Dollon's medical unit for their active collaboration in collecting data as well as Carmen Ruffino and Michel Kossovsky for help with the database.

## Funding / potential competing interests

No funding; no competing interests.

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