

Original Article

Screening of asymptomatic *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections among men who have sex with men in Hong Kong

香港男同性戀者間的無症狀沙眼衣原體和淋病雙球菌感染篩查

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Objective: This study investigated the prevalence of asymptomatic *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG) infections in various anatomical sites among men who have sex with men (MSM) in Hong Kong. **Methods:** MSM attending the Social Hygiene Clinics with no symptoms of CT or NG infections were recruited. Swabs were collected from the urethra, rectum and pharynx to screen for CT and NG infections. **Results:** 158 MSM with a median age of 27 years were enrolled. The prevalence of asymptomatic CT or NG infections from any site was 19.6%. Rectal screening alone detected around three quarters of total infections. **Conclusions:** A substantial number of asymptomatic CT or NG infections were detectable by routine screening among MSM in Hong Kong. Extra-genital screening especially from the rectum is therefore important.

目的：本研究調查香港男同性戀者間多個身體部位的無症狀沙眼衣原體和淋病雙球菌感染的流行情況。**方法：**在社會衛生科內，招募沒有沙眼衣原體或淋病雙球菌感染病徵的男同性戀就診者。收集其尿道、直腸和咽喉的拭子樣本，篩查有否沙眼衣原體和淋病雙球菌感染。**結果：**共招募了158名年齡中位數為27歲的男同性戀者。合計所有部位的無症狀沙眼衣原體或淋球菌感染的患病率為19.6%。直腸單一部位篩查出的感染已差不多佔總感染的四分之三之多。**結論：**在香港男同性戀者間的常規篩查檢測當中，可發現比重不少的無症狀沙眼衣原體或淋病雙球菌感染。生殖器以外的篩查尤其是直腸，實為重要。

Keywords: Chlamydia, gonorrhoea, men who have sex with men, screening

關鍵詞：衣原體、淋病、男同性戀者、篩查

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Introduction

Chlamydia trachomatis (CT) and *Neisseria gonorrhoeae* (NG) infections are the two most common bacterial sexually transmitted infections (STIs) worldwide.¹ Both CT and NG infections have been associated with an increased risk of transmission and acquisition of Human Immunodeficiency Virus (HIV) infection.² In Hong

Kong, an alarming rising trend of new HIV infections among men who have sex with men (MSM) has been observed over the last decade.³ Thus, screening for these STIs in populations at increased risk for HIV is warranted.

Currently there are no screening guidelines for CT and NG infections among MSM attending Social Hygiene Clinics (SHC) in Hong Kong. Testing is usually offered only to patients with symptoms suggestive of these infections. Since rectal and pharyngeal CT and NG infections are mostly asymptomatic,⁴⁻⁷ a symptom-based approach usually involves urethral testing alone. Asymptomatic infections especially of the rectal and pharyngeal sites which serve as a reservoir for further spread may therefore be missed.

The United States Center for Disease Control and Prevention (USCDC) recommends that sexually active MSM with relevant exposures regardless of condom use should be screened for urethral CT and NG, rectal CT and NG, and pharyngeal NG, at least annually and every 3-6 months for men at highest risk (e.g. those with multiple partners or those who used illicit drugs).⁸ However, various screening strategies that are different from the USCDC's recommendations have been developed across different areas,^{9,10} based on their local prevalence study of CT and NG infections at various anatomical sites among MSM.

This study aimed to investigate the prevalence of asymptomatic urethral, rectal and pharyngeal CT and NG infections among MSM attending SHC in Hong Kong, and to evaluate any associated factors for these infections. The detection rate and cost of different screening strategies was also calculated and compare with each other.

Methodology

This was a cross-sectional study conducted in the Yau Ma Tei Male SHC (YMT MSHC) and Wan Chai Male SHC (WC MSHC). MSM attended these SHC

with age equal or greater than 18 years were invited to participate in the study. As the aim of this study was to assess the screening of asymptomatic NG and CT infections rather than diagnostic testing, patients with symptoms (i.e., urethral discomfort, urethral discharge, scrotal pain, rectal discomfort, rectal discharge, or sore throat) suggestive of CT or NG infections were excluded. Patients who had been treated for CT or NG infections within six weeks were also excluded to avoid false positive results.

The participants completed a self-administered questionnaire about their socio-demographic information, past history of STIs and sexual practices. Urethral, rectal and pharyngeal swabs were then collected from each participant. The specimens of each site were sent for NG culture on modified Thayer Martin plate, and for nucleic acid amplification test (NAAT) of CT and NG by Aptima Combo-2 Assay (AC2 assay, Gen-probe Inc, San Diego, California, USA). The validity and performance of AC2 assay for detecting extra-genital CT and NG infections has been verified by many studies in the literature.¹¹⁻¹⁴ In addition, on-site Gram staining and microscopic examination of the urethral specimens were done in the SHC.

The positive infections in this study were defined as:

- CT infection of urethra, rectum or pharynx if NAAT of CT is positive,
- NG infection of urethra, rectum or pharynx if either NG culture or NAAT of NG is positive,
- NG infection of urethra if intracellular Gram negative kidney-shaped diplococci are found in on-site microscopic examination of urethral specimen.

All data analyses were performed using PASW Statistics 18, Release Version 18.0.0 (SPSS, Inc., 2009, Chicago, IL, www.spss.com). Multivariate logistic regression analysis was performed to determine independent risk factors for CT or NG infection from any site. Concerning categorical data, the chi-square test and Fisher's exact test

were used according to the data pattern. For continuous data with a highly skewed distribution, a non-parametric test (i.e. Mann-Whitney U test) was used. The critical level of statistical significance was set at 0.05.

Results

There were 158 MSM recruited in the study. The age of the participants ranged from 18 to 52 years, the median age was 27 years. All participants received education up to secondary or post-secondary. The majority of the participants were Chinese (88.6%). Regarding test for CT and NG infections with urine or swab from any of three anatomical sites (i.e. urethra, rectum or pharynx), 78.5% of the participants recalled that they had not had any of these tests within recent one year. Seventeen point seven percent of the participants confessed to having taken soft drugs at some time in the past.

There were 31 participants (19.6%) who were found to have CT or NG infections from at least one of three anatomical sites, including 22 of whom had CT infection and 14 cases were found to have NG infection. According to their clinical records, 20 positive cases were totally asymptomatic at the point of recruitment, seven cases presented with generalised rash due to secondary syphilis and four cases attended SHC

Table 1. Prevalence of CT and NG infections found in this study

	Percentage (cases/158)	95% Confidence interval
CT or NG infections from any of 3 sites	19.6% (31/158)	13.7%-26.7%
Urethral CT	4.4% (7/158)	1.8%-8.9%
Urethral NG	0% (0/158)	0%-2.3%
Rectal CT	11.4% (18/158)	6.9%-17.4%
Rectal NG	6.3% (10/158)	3.1%-11.3%
Pharyngeal CT	2.5% (4/158)	0.7%-6.4%
Pharyngeal NG	3.2% (5/158)	1.0%-7.2%

for perianal growth due to genital warts. The most frequently detected infection was rectal CT which was found in 11.4% (18/158) of the participants. Rectal NG was found in 6.3% (10/158) of the participants. Urethral CT was detected in 4.4% (7/158) and no urethral NG (0%) was found. Pharyngeal CT and NG were found in 2.5% (4/158) and 3.2% (5/158) of the participants respectively (Table 1). Figure 1 shows the number of infections found at each site with overlapping areas representing infections found at both sites.

Multivariate logistic regression analysis showed that significant ($p < 0.05$) predictors associated with CT or NG infections from any of three sites included younger age, lower educational level, history of soft drug use and unprotected anal sex within one month (Table 2).

To compare different screening strategies, the proportion of CT or NG infections that would have been detected by different combinations of screening sites was calculated (Table 3 & Figure 2). A case was considered to be missed under a screening strategy if either CT or NG infection from any site was not treated based on the screening

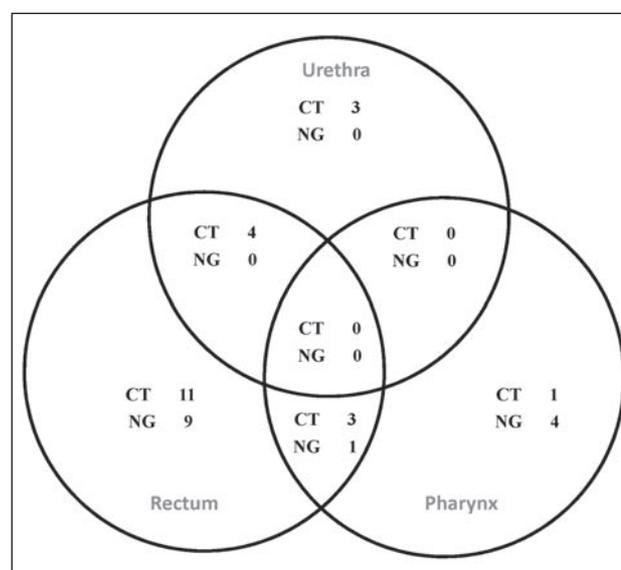


Figure 1. Number of CT and NG infections found at each anatomical site among 31 positive cases (5 cases had both CT and NG infections).

result. Currently, the Public Health Laboratory Centre charges HK\$330 for each AC2 assay requested by the private sector. This reference fee was used to calculate and compare the cost of various screening strategies (Table 3 & Figure 3).

Discussion

This study showed that the prevalence of any CT or NG infection from at least one anatomical site was 19.6%. This prevalence was relatively high compared to similar overseas studies (Table 4).¹⁵⁻²¹ The reason for this may be due to different clinical setting of most overseas studies which recruited asymptomatic HIV-infected MSM during their regular visits to HIV clinics for medical care. In contrast, the MSM recruited in this study were those who came to the SHC to rule out STIs. MSMs with a higher risk of contracting STIs may have been more willing to join the study to undergo comprehensive screening. Moreover, the

participants in this study were relatively younger (median age 27 years) than those of many overseas studies (median age 38-51 years).^{15,17,19-21} Younger age as a significant risk factor for CT and NG infections among MSM has been shown in this study and also many other studies in the literature.^{4,17,18}

Table 2. Multivariate logistic regression for predictors of infections from any of three anatomical sites

	Multivariate logistic regression OR (95% CI)	p-value
Age (continuous variable)	OR per year=0.88 (0.81-0.95)	0.001
Education		
- Secondary	Referent	
- Post-secondary	OR=0.22 (0.09-0.59)	0.002
Soft drug ever used before	OR=5.42 (1.78-16.54)	0.003
Unprotected anal sex in 1 month	OR=2.94 (1.19-7.26)	0.020

Table 3. Screening strategies using different screening site combinations

Screening strategies	Number of cases detected N ^{DET} (% of total 31 cases)	Number of AC2 assays needed N ^{AC2}	Cost per detected case = $\frac{\$330 \times N^{AC2}}{N^{DET}}$
Universal 3-sites	31 (100%)	474	\$5046
Urethral-only	6 (19.4%)	158	\$8689
Rectal-only	23 (74.2%)	158	\$2267
Pharyngeal-only	7 (22.6%)	158	\$7448
Rectal + Urethral	27 (87.1%)	316	\$3861
Rectal + Pharyngeal	28 (90.3%)	316	\$3726
Urethral + Pharyngeal	14 (45.2%)	316	\$7448

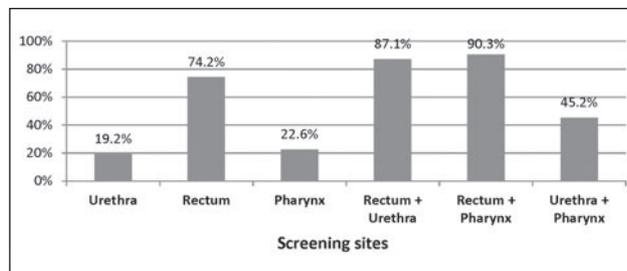


Figure 2. Proportions of infections detected by different screening strategies.

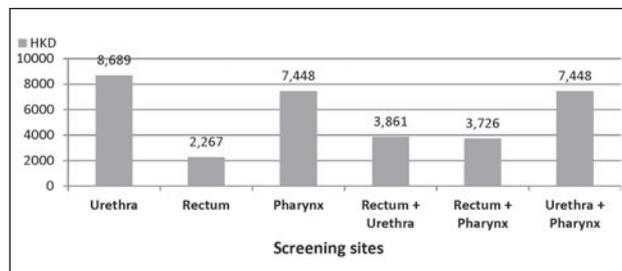


Figure 3. Cost of detecting one infected case by different screening strategies.

In this study, the rectum was the most frequently infected anatomical site and this result agreed with the findings from similar overseas studies (Table 4). The reason for this can be explained by a large MSM study conducted in San Francisco which showed that around 85% of rectal CT or NG infections among MSM were asymptomatic.⁴ On the other hand, 90% of urethral NG infections found in that study were symptomatic.⁴ This explains the extreme low prevalence of urethral NG found among asymptomatic MSM in this and other overseas studies.

NG culture only detected NG in one rectal specimen while NAAT revealed 15 specimens from either rectum or pharynx to have NG infections in this study. The low sensitivity of NG culture compared to NAAT in asymptomatic MSM was also observed from many overseas studies.^{17,22} The low sensitivity of NG culture for asymptomatic infection can be explained by the study of Bissessor et al,²³ which showed that the bacterial loads among symptomatic rectal NG infection were much higher than that found in asymptomatic infection. Therefore, we do not recommend performing NG culture as part of screening for asymptomatic NG infection. However, the role of NG culture for antibiotic resistance surveillance cannot be replaced by NAAT. For this purpose, another swab for NG culture can be performed

before treatment is given to infected patients picked up by NAAT.

Urethra-only screening only detected 19.4% of total infections in this study. In contrast, rectal-only screening detected around three quarters (74.2%) of total infections. The cost of each detected case by rectal-only screening (\$2267) is much lower than that of urethral-only screening (\$8689) and pharyngeal-only screening (\$7448). The detection rate could be further increased to 90.3% if rectal screening was combined with pharyngeal screening. Pharyngeal screening is important because untreated pharyngeal infections may play a critical role in antibiotic resistant NG infections,²⁴ as well as serve as an important reservoir of infection.²⁵ However, the cost of rectal-pharyngeal combination screening (\$3726) is about two thirds higher than that of rectal-only screening. Therefore, we may consider the strategies of rectal-only screening or rectal-pharyngeal screening depending on the budget of the screening programme.

Conclusions

This study revealed that a substantial proportion (19.6%) of MSM have asymptomatic CT or NG

Table 4. Comparison of current study and similar overseas studies

	Prevalence of total infections	Urethral CT	Urethral NG	Rectal CT	Rectal NG	Pharyngeal CT	Pharyngeal NG
Current study 2015, HK	19.6%	4.4%	0%	11.4%	6.3%	2.5%	3.2%
Soni et al ¹⁵ 2011, UK	17.4%	2.6%	1.3%	9.8%	4.2%	1.7%	3.9%
Marcus et al ¹⁶ 2011, USA	16.2%	2.3%	0.4%	7.8%	3.6%	1.9%	5%
Rieg et al ¹⁷ 2008, USA	13.7%	1.5%	1.5%	6.8%	4.3%	1.4%	3.3%
Carpenter et al ¹⁸ 2013, USA	24%	0%	1%	18%	8%	2%	3%
Mimiaga et al ¹⁹ 2007, USA	11.4%	2.6%	1%	6.1%	1.7%	N/A	N/A
Pérez-Hernández et al ²⁰ 2014, Spain	9.7%	1.6%	0%	6%	2%	0.8%	2%
Baker et al ²¹ 2009, USA	5.8%	0%	0%	1.7%	0.8%	0.4%	2.9%

N/A: Not mentioned in the article

infections at any of the three anatomical sites (urethra, rectum or pharynx). The data support routine screening for these infections among MSM in Hong Kong. Screening is particularly indicated for MSM who are relatively young and who had a lower education level, a history of soft drug use, or unprotected anal sex recently.

Urethral-only screening is not effective and detected less than 20% of total asymptomatic infections in the study. On the other hand, the rectum was found to be the most frequently infected site of asymptomatic CT and NG among MSM. Rectal-only screening by using NAAT AC2 assay detected around three quarters of total asymptomatic infections in this study, and the detection rate can be raised to 90% if both the rectum and pharynx are screened.

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