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Prevalence of *Chlamydia trachomatis* infection in the general population of women in Qatar

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Arabic Abstract translation

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ABSTRACT

Objectives The Arabian Gulf region has limited epidemiological data related to sexually transmitted infections. The objective of this study was to estimate the prevalence of *Chlamydia trachomatis* infection among general population women in Doha, Qatar.

Methods Endocervical swabs were collected from healthy women attending primary healthcare centres in Doha, June–December 2008. The specimens were tested for *C trachomatis* by a commercially available PCR-based assay. Data on basic socio-demographic characteristics, medical history and sexual behaviour were obtained using self-administered questionnaires. The prevalence of *C trachomatis* and of background variables were stratified by nationality, Qatari nationals versus non-Qatari residents.

Results A total of 377 women were enrolled in the study, out of whom 351 (37.9% Qataris, 62.1% non-Qataris) were tested for the presence of *C trachomatis* in their specimens. The mean age of participants was 41.2 years, and the vast majority (93%, 95% CI 90.3 to 95.7) were married. The mean age at sexual debut was significantly lower among Qatari women compared with non-Qatari women (19.2 vs 22.2 years, respectively $p < 0.001$), but the mean number of reported lifetime sexual partners (1.1 partner) was nearly the same in both groups ($p = 0.110$). The prevalence of *C trachomatis* infection was 5.3% among Qatari women and 5.5% among non-Qatari women, with no statistically significant difference between both groups ($p = 0.923$).

Conclusions The prevalence of *C trachomatis* among women was higher than expected, with no significant difference between Qatari nationals and expatriate residents. The higher prevalence may reflect, in part, the limited access to and use of chlamydia screening and management.

INTRODUCTION

Data on the prevalence of *Chlamydia trachomatis* infection in the Middle East and North Africa (MENA) region remain scarce due to its limited research capacity and sociocultural sensitivity around sexually transmitted infections (STIs).^{1, 2} This challenge is further compounded by methodological limitations in available studies and by the logistical difficulty in conducting STI studies among women.² Considering that *C trachomatis* is one of the most common curable bacterial STIs worldwide,³ and given its complications in infected women in terms of pelvic inflammatory disease, infertility and ectopic pregnancy among others,³ there is a need to address the invisible and poorly quantified disease burden of this infection in this part of the world. Against this background, the

objective of the present study was to estimate the prevalence of *C trachomatis* infection among general population women in Qatar.

METHODOLOGY

Study design and participants

This was a cross-sectional study on healthy asymptomatic ever-married women attending eight women's primary healthcare centres in the capital city, Doha, for a routine Pap smear examination during the period June to December 2008. A component of this study was focused on studying human papillomavirus epidemiology, and therefore, centres were considered only if Pap smear examination was offered. More than 70% of the total population of Qatar are non-Qatari,⁴ but Qataris were the primary target population for this study. Based on the advice of the Qatar Supreme Council of Health, these centres were chosen as they are frequented by Qatari nationals and offer Pap smear examination. The centres represent the core of primary healthcare services in Qatar serving over a million attendees per year within the women's clinics and the other clinics. All Qatari and resident non-Qatari women have access to these centres and the services are covered by the national health insurance programme. All the centres are in urban settings, and they cover both primary care as well as follow-up services.

Pregnant women were excluded. Study participants were enrolled by the attending physician and filled a self-administered questionnaire, which included data on sociodemographic and lifestyle indicators, reproductive and medical history and sexual behaviour. Only few questions about sexual behaviour were included, due to the sensitivity of this issue among this population. The study was approved by the Hamad Medical Corporation Research Committee, and all participants signed informed consent forms prior to enrolment in the study.

Biological sample collection and laboratory analysis

Endocervical swabs were collected by the attending physician. DNA extraction was performed, followed by PCR, using the commercially available *Chlamydia trachomatis* Real-TM PCR kit (Sacace Biotechnologies, Italy).

Data analysis

Cross-tabulations between the different background variables, as well as the biomarker for *C trachomatis* infection, and nationality (Qatari vs non-Qatari) were performed in order to describe the



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characteristics of the study population. The prevalence of *C trachomatis* was also stratified by the sociodemographic and lifestyle indicators, reproductive and medical history factors and sexual behaviour characteristics for the Qatari versus non-Qatari women. The χ^2 test or the Fisher's exact test (for categorical variables) and the student t test (for continuous variables) were used to determine statistical significance in these associations. ORs for bivariate associations between the background variables and a positive *C trachomatis* test were derived using logistic regression. IBM-SPSS (Statistical Packages for the Social Sciences) V21.0 was used for all statistical analyses. The statistical significance was set at $p < 0.05$.

RESULTS

A total of 377 women were enrolled in the study, out of whom 351 (37.9% Qataris, 62.1% non-Qataris) were tested for the presence of *C trachomatis* in their specimens. The characteristics of tested and non-tested women were compared. No significant differences were found except for educational level ($p = 0.010$), where a higher percentage of those who took the test had a college degree compared with those who did not. Table 1 describes the characteristics of the study population who were tested for the presence of *C trachomatis*, stratified by nationality. The mean age of the participants was 41.2 years, and the vast majority (93.0%; 95% CI 90.3 to 95.7) were currently married. The proportion of women with no educational attainment was significantly higher ($p < 0.001$) among Qataris (35.9%) compared with non-Qataris (8.3%). Only a small fraction of the participants smoked (5.8%; 95% CI 3.3 to 8.3). The vast majority of the participants had children (95.7%; 95% CI 93.6 to 97.8); 72.5% of Qataris had more than four children compared with 37.2% of non-Qataris ($p < 0.001$).

Almost all respondents reported no prior history of a sexually transmitted disease; 7.4% (95% CI 4.7 to 10.3) had a family history of cervical cancer; 92.6% (95% CI 89.7 to 95.4) were not using oral contraceptives at the time of the study and 14.2% (95% CI 10.5 to 18.0) had regular Pap smear tests, with no statistically significant differences for these characteristics between the two nationality groups. The mean age at sexual debut was significantly lower among Qatari women (19.2 vs 22.2 years; $p < 0.001$), but the mean number of reported lifetime sexual partners (1.1 partner) was nearly the same for both groups ($p = 0.110$). Less than 10% of these women reported more than one lifetime sexual partner, and less than 1% had more than two partners. Nineteen women tested positive for *C trachomatis* indicating an overall prevalence of 5.4% (95% CI 3.0 to 7.8). The prevalence of *C trachomatis* was 5.3% among Qatari women and 5.5% among non-Qatari women, with no statistically significant difference between the two groups ($p = 0.923$).

Analyses of ORs were conducted to identify the different sociodemographic and lifestyle indicators, reproductive and medical history factors and sexual behaviour characteristics associated with a positive *C trachomatis* test. No statistically significant associations were found with any of the variables, probably reflecting the small number of those who tested positive. We also found no statistically significant differences in the prevalence of *C trachomatis* stratified by the sociodemographic and lifestyle indicators, reproductive and medical history factors and sexual behaviour characteristics for the Qatari versus non-Qatari women.

DISCUSSION

We documented a considerable prevalence of *C trachomatis* infection among women attending primary healthcare centres in Qatar. The prevalence of about 5% is broadly comparable with

reported figures in the United Arab Emirates⁵ and Kuwait⁶ within the Arabian Gulf region, in other MENA countries,² as

Table 1 Characteristics of the study population by nationality, women attending women's primary healthcare centres, Doha, Qatar, 2008

| | Qatari (N=133) n (%)* | Non-Qatari (N=218) n (%)* | Total (N=351) n (%)* | p Value |
|--|-----------------------------|---------------------------------|----------------------------|---------|
| Sociodemographic and lifestyle indicators | | | | |
| Age | | | | |
| 20–29 | 14 (10.7) | 35 (16.1) | 49 (14.0) | |
| 30–39 | 33 (25.2) | 67 (30.9) | 101 (28.9) | |
| 40–49 | 54 (41.2) | 74 (34.1) | 128 (36.7) | |
| ≥50 | 30 (22.9) | 41 (18.9) | 71 (20.3) | 0.221 |
| Mean (SD) | 42.45 (9.43) | 40.52 (10.21) | 41.24 (9.96) | 0.079 |
| Current marital status | | | | |
| Married | 112 (86.2) | 207 (97.2) | 319 (93.0) | |
| Non-married | 18 (13.8) | 6 (2.8) | 24 (7.0) | <0.001 |
| Educational level | | | | |
| None | 46 (35.9) | 18 (8.3) | 64 (18.6) | |
| School | 54 (42.2) | 71 (32.9) | 125 (36.3) | |
| College | 28 (21.9) | 127 (58.8) | 155 (45.1) | <0.001 |
| Smoking | | | | |
| Yes | 4 (3.1) | 16 (7.4) | 20 (5.8) | |
| No | 126 (96.9) | 200 (92.6) | 326 (94.2) | 0.095 |
| Reproductive and medical history | | | | |
| Number of children | | | | |
| 0 | 6 (4.6) | 9 (4.1) | 15 (4.3) | |
| 1–3 | 30 (22.9) | 128 (58.7) | 158 (45.3) | |
| ≥4 | 95 (72.5) | 81 (37.2) | 176 (50.4) | <0.001 |
| Mean (SD) | 5.44 (3.05) | 3.21 (1.93) | 4.05 (2.64) | <0.001 |
| Previous miscarriage | | | | |
| 0 | 72 (54.5) | 131 (61.2) | 203 (58.7) | |
| 1–2 | 45 (34.1) | 69 (32.2) | 114 (32.9) | |
| ≥3 | 15 (11.4) | 14 (6.5) | 29 (8.4) | 0.227 |
| Mean (SD) | 0.95 (1.40) | 0.69 (1.16) | 0.79 (1.26) | 0.056 |
| Current oral contraceptive use | | | | |
| Yes | 8 (6.2) | 17 (8.2) | 25 (7.4) | |
| No | 121 (93.8) | 190 (91.8) | 311 (92.6) | 0.495 |
| STD history | | | | |
| Yes | 0 (0.0) | 1 (0.5) | 1 (0.3) | |
| No | 132 (100.0) | 211 (99.5) | 343 (99.7) | 0.999 |
| Frequency of Pap smear | | | | |
| Never | 37 (28.9) | 68 (32.5) | 105 (31.2) | |
| Regular | 13 (10.2) | 35 (16.7) | 48 (14.2) | |
| Irregular | 78 (60.9) | 106 (50.7) | 184 (54.6) | 0.118 |
| Family history of cervical cancer | | | | |
| Yes | 8 (6.1) | 18 (8.3) | 26 (7.4) | |
| No | 124 (93.9) | 198 (91.7) | 323 (92.6) | 0.434 |
| Sexual behaviour | | | | |
| Age of sexual debut | | | | |
| ≤15 years | 30 (23.3) | 21 (10.0) | 51 (15.0) | |
| >15 years | 99 (76.7) | 190 (90.0) | 289 (85.0) | 0.001 |
| Mean (SD) | 19.91 (5.17) | 22.15 (5.19) | 21.31 (5.29) | <0.001 |
| Number of years since sexual debut | | | | |
| <10 | 24 (18.3) | 58 (27.0) | 82 (23.7) | |
| 10–19 | 38 (29.0) | 79 (36.7) | 117 (33.8) | |
| 20–29 | 42 (32.1) | 46 (21.4) | 88 (25.4) | |
| ≥30 | 27 (20.6) | 32 (14.9) | 59 (17.1) | 0.026 |
| Mean (SD) | 19.92 (11.06) | 17.00 (10.06) | 18.08 (10.52) | 0.012 |

Continued

Table 1 Continued

| | Qatari (N=133) n (%)* | Non-Qatari (N=218) n (%)* | Total (N=351) n (%)* | p Value |
|--|-----------------------------|---------------------------------|----------------------------|--------------|
| Number of lifetime sexual partners | | | | |
| 1 | 115 (89.8) | 205 (96.2) | 320 (93.8) | |
| 2 | 12 (9.4) | 6 (2.8) | 18 (5.3) | |
| ≥3 | 1 (0.8) | 2 (0.9) | 3 (0.9) | 0.023 |
| Mean (SD) | 1.11 (0.34) | 1.05 (0.30) | 1.07 (0.31) | 0.110 |
| <i>Chlamydia trachomatis</i> infection | | | | |
| <i>Chlamydia trachomatis</i> results | | | | |
| Negative | 126 (94.7) | 206 (94.5) | 332 (94.6) | 0.923 |
| Positive | 7 (5.3) | 12 (5.5) | 19 (5.4) | |

NB: Numbers do not necessarily add up to the total because of missing values, and numbers in bold represent significance at $p < 0.05$.

STD, sexually transmitted disease.

*Column percentages.

well as globally in North America,^{7 8} Europe,^{9 10} Asia,^{11 12} Oceania^{13 14} and sub-Saharan Africa.¹⁵ Nevertheless, the prevalence tends to be at the higher side of the global range particularly in view of the average age of the participants. This finding was not expected considering the prevailing sexually conservative norms and low reported sexual-risk behaviour in the MENA region.^{2 16}

This result, however, may not be interpreted as necessarily higher than expected levels of sexual risk behaviour. The fact that there are no formal *C trachomatis* screening programmes, or any specific bacterial STIs prevention and treatment programmes, may have contributed to the higher prevalence. As seen in other populations globally, limited active chlamydia diagnosis and specific treatment can lead to surprisingly high levels of prevalence, as a consequence of the asymptomatic nature of this infection and its persistence for months or years if untreated.^{17 18} The high sensitivity of the employed microbiological assay may have also contributed to a higher positivity rate,^{15 19 20} as well as the enforced restricted-access to antibiotics in Qatar in view of an ecological correlation between antibiotics use and lower prevalence.²¹ Since the study participants, irrespective of their nationality, have access to the services offered by the national healthcare system, it is not likely that differences in access to healthcare can explain the difference in prevalence among Qatari versus non-Qatari women. Regardless, the difference was small and not statistically significant.

On the other hand, the observed prevalence suggests that risks for acquiring the infection are present, though not necessarily through the women's own behaviour. The women likely acquired the infection from their spouses, an observation supported by the overall pattern of STIs in MENA.^{2 16} For example, although women are estimated to account for 9% of people engaged in high-risk behaviour in Morocco, they contribute to about 50% of new HIV infections.²² Similarly, 97%²³ and 76%^{24 25} of notified HIV-infected women in Saudi Arabia and Iran, respectively, have acquired the infection from their husbands. In view of the high mobility of the population in Qatar and the fact that more than 70% are expatriates,⁴ the infection transmission networks likely transcend the borders of this country.

We recruited women attending healthcare centres, and such a population may not be representative of the female population in Qatar. Reporting bias may have affected our study with the stigma surrounding STIs in this population. Chlamydia prevalence tends to be low in general population groups, and the

employed PCR kit has not been validated in our study population, thereby potentially undermining the positive predictive value of the diagnostic test.²⁶ With the small number of infections in the sample, and the few sexual behaviour measures collected, our study also lacked an analytical design to examine specific risk factors for the infection. The predictors of infection and the age distribution of infection among these women could strikingly be different from those in other settings given the differences in sociocultural context and sexual networking. Future studies on *C trachomatis* should consider larger sample sizes to allow for identification of the predictors of infection and should include testing for other STIs, such as gonorrhoea and herpes simplex virus type 2. This will add key data to our knowledge of STIs in this part of the world.

Despite these limitations, our study, the first of its nature in Qatar, is an endeavour to examine a neglected disease burden in spite of challenges limiting the conduct of such studies. Our findings highlight a disease burden that is largely not being dealt with, but should be addressed through targeted programmes for sexual health and STIs for both women and men. Such programmes need to be culturally sensitive and gender-specific to be acceptable and relevant, and should capitalise on the strengths of MENA's cultural traditions.²⁷ Considering the modest contribution of our study to informing specific policy and programming, further research on representative population samples and cost-effectiveness analyses are needed before specific screening and treatment programmes could be recommended. Opportunistic targeted screening could be a meaningful starting point, with potentially routine Pap smear testing as an entry point.

CONCLUSION

We documented higher than expected *C trachomatis* prevalence in Qatar, possibly reflecting the limited specific diagnosis and treatment programmes. Our study highlights how the disease burden of STIs, even in a sexually conservative society, could be significant with the lack of STI-specific programmes. Since multiple STIs are curable, including *C trachomatis*, detecting these infections and linking them with appropriate treatment channels could alleviate an unnecessary disease burden and its consequences in the population.

Key messages

- ▶ We found higher than expected prevalence of *Chlamydia trachomatis* infection among women attending primary healthcare centres in Qatar, with no significant difference in prevalence between Qatari nationals and expatriate residents.
- ▶ The observed prevalence may reflect the limited access and use of Chlamydia-specific screening and management.

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Contributors AA-T designed the study, developed the research methodology and led the data collection and interpretation of the results. EA and HNB did the laboratory work and were responsible for the data management. PH conducted most of the statistical analyses. GRM and LJA-R wrote the first draft of the article. All authors contributed to the interpretation of the findings and writing of the article.

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Competing interests None.

Patient consent Obtained.

Ethics approval Hamad Medical Corporation Research Committee.

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معدل انتشار عدوى المُتَدَثِّرَةُ الحَثْرِيَّة (Chlamydia trachomatis) عند النساء في قطر

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ملخص

الأهداف: لا تملك منطقة الخليج العربي كميةً وافيةً من المعطيات الوبائية حول الأمراض المنقولة جنسياً. هدفت هذه الدراسة إلى تقصي نسبة انتشار عدوى المُتَدَثِّرَةُ الحَثْرِيَّة (Chlamydia trachomatis) عند النساء في الدوحة، قطر.

المنهجية: تم جمع عيّنات بواسطة مسح باطن عنق الرحم لنساءٍ سليّمات خلال تواجدهن في مراكز للرعاية الصحية الأولية في الدوحة، بين حزيران و كانون الأول من العام 2008. تمّ فحص هذه العيّنات للتحقق من وجود المُتَدَثِّرَةُ الحَثْرِيَّة وذلك باستخدام اختبار تجاري يعتمد على تفاعل سلسلة البوليميرات (PCR-based assay). كما تم جمع معلومات حول الخصائص الديموغرافية والاجتماعية، التاريخ الطبي، والسلوك الجنسي للنساء المشاركات من خلال استبيانات ذاتية. جرى قياس معدل انتشار المُتَدَثِّرَةُ الحَثْرِيَّة بالإضافة إلى متغيّراتٍ أخرى طبقاً لفئات الجنسية أي القطريات مقابل غير القطريات.

النتائج: شملت الدراسة 377 امرأة وتم فحص 351 منهنّ (37.9% قطريات و 62.1% غير قطريات) للتحقق من وجود المُتَدَثِّرَةُ الحَثْرِيَّة. بلغ معدل سنّ المشاركات في الدراسة 41.2 عاماً والأغلبية الساحقة من النساء كنّ متزوجات (93%)، فاصل الثقة 95%: 90.3 إلى 95.7). معدل السن عند الشروع بالنشاط الجنسي كان أكثر انخفاضاً لدى النساء القطريات مقارنةً بغير القطريات (19.2 مقابل 22.2 عاماً، القيمة الإحصائية الاحتمالية الأدنى من 0.0001). أما معدل عدد الشركاء الجنسيين العام (1.1 شركاء) فلم يختلف بين الفئتين (القيمة الاحتمالية الاحتمالية = 0.110). بلغ معدل انتشار المُتَدَثِّرَةُ الحَثْرِيَّة 5.3% لدى القطريات و 5.5% لدى غير القطريات من دون وجود فرق ذات أهمية إحصائية بين المجموعتين (القيمة الاحتمالية الاحتمالية = 0.923).

الخلاصة: بلغ انتشار المُتَدَثِّرَةُ الحَثْرِيَّة معدلاً أعلى من المتوقع من دون فرق ذات أهمية إحصائية بين القطريات وغير القطريات. قد يكون هذا المعدل المرتفع نسبياً ناجماً عن تعثر الوصول إلى واستخدام اختبار الكشف عن المُتَدَثِّرَةُ الحَثْرِيَّة وحسن متابعة العدوى.