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Genitourinary Symptoms Associated with *Chlamydia trachomatis* and *Neisseria gonorrhoeae* Infections in a Tertiary Care Hospital in Oman

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Abstract

Objectives: To determine the pattern of clinical presentations associated with *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections. ***Methods:*** A retrospective cohort study between 2015 - 2020 of 408 women and 89 men who were tested for these infections by nucleic acid amplification attending Sultan Qaboos University Hospital, Muscat, Oman. ***Results:*** Eleven infections were identified in women (11/408, 2.7%) and fourteen in men (14/89, 15.7%). Chlamydia accounted for almost all infections in women (10/11, 91%), commonly presenting with lower abdominal pain or abnormal vaginal bleeding. In men, urethral discharge/dysuria syndrome was the commonest presentation and chlamydia was identified in 8 men and gonorrhoea in 6; 80% of all infections were seen in patients ≤ 35 years. ***Conclusions:*** The relative prevalence of two common sexually transmitted infections among patients with genitourinary symptoms at a tertiary referral hospital are described. The pattern of their presentations will inform the design of prospective

studies to improve surveillance and guide public health policy in Oman. The study highlights the need for a multi-sectoral approach involving all providers to enable comprehensive STI surveillance.

Keywords: Genitourinary Symptoms; Chlamydia trachomatis; Neisseria gonorrhoeae; Oman.

Advances in knowledge

- Aetiological assessment of genitourinary symptoms is an important epidemiological tool in understanding the clinical presentation and relative prevalence of sexually transmitted infections (STIs).
- This is the first study conducted in Oman to describe how nucleic acid amplification diagnostics are used to diagnose two common curable STIs in a tertiary hospital setting.

Application to Patient Care

- Symptoms alone are not sufficiently sensitive or specific in identifying STIs.
- The study supports the wider availability of diagnostic tests and the transition towards an aetiological approach to STI case management in Oman.

Introduction

Sexually transmitted infections (STIs) are an important focus of public health policy in Oman. A key aspect for STI control is the early and efficacious management of patients, using either a syndromic approach or clinical management based on laboratory tests (aetiological approach). The latter approach, especially when using highly accurate and sensitive molecular diagnostic tests, has the advantage of identifying the specific STI pathogen/s so that targeted antimicrobial therapy can be given, with the potential of improving STI case management and surveillance, as well as avoiding unnecessary and wasteful treatments.

Oman's public health services have largely relied on the syndromic management approach, with utilisation of flowcharts (algorithms) for each of the five recognised STI syndromes- male urethral discharge, vaginal discharge, lower abdominal (pelvic) pain in women, scrotal swelling, and genital ulceration.[1] Laboratory tests are not

undertaken for most STI patients who receive syndromic management. Nevertheless, periodic laboratory-based aetiological assessments are needed to check the relevance of the flowcharts, and laboratories play a key role in STI surveillance, research programmes and informing public health policies.[2,3,4]

In contrast to public health services, Sultan Qaboos University Hospital has been providing STI diagnostics for the detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections since 2014 for patients presenting with genitourinary symptoms, including infertility. These are two of the commonest curable STIs and are associated with significant sexual and reproductive morbidity including adverse birth outcomes, pelvic inflammatory disease, tubal factor infertility, ectopic pregnancy and epididymo-orchitis.[5,6,7]

There are regional differences in the prevalence of chlamydia and gonorrhoea, with the Middle East and North Africa (MENA) having relatively low rates of both infections in either sex compared to other regions, notably the Americas and Western Pacific.[5] While cultural influences and adherence to religious teachings may explain some of these differences in the MENA region, stigma, embarrassment, lack of awareness and limited access to molecular diagnostic tests may also account for under-reporting.

As the aetiology of STI syndromes in Oman has never previously been studied using molecular diagnostic tests, the purpose of this exploratory study was to investigate the relative prevalence of chlamydia and gonorrhoea associated with genitourinary symptoms to inform patient care, and to identify areas of STI surveillance that may require strengthening.

Methods

This was a retrospective cohort study of patients who attended Sultan Qaboos University Hospital (SQUH) and tested for gonorrhoea and chlamydia. SQUH is a 600 bed university teaching hospital and tertiary referral centre based in the A' Seeb *wilayat* (district) in Muscat governorate, the capital of Oman.

The study population consisted of women who were tested between 1st January and 31st December 2020 and men between 1st January 2015 and 31st December 2020. The Xpert® CT/NG (Cepheid Inc., Sunnyvale, CA, USA) nucleic acid amplification test (NAAT) was used for chlamydia and gonorrhoea detection from endocervical swabs (women) or first-catch urine specimens (men).[8] Women who were pregnant and patients who had taken antibiotics in the previous two weeks or had invalid NAAT results (from improper sample processing, PCR inhibition or sample processing control not detected in the test sample) were excluded. Tests for HIV and syphilis were offered to patients diagnosed with chlamydia and gonorrhoea and to those requesting screening.

Test results were recorded and matched with the patient's sociodemographic information (age, gender, marital status), the type of clinic they attended and their main presenting symptom. All data collected for this study were anonymised and patient identifiable details removed.

We used descriptive statistics to describe the study population. We used the Chi-square test to assess differences between groups. Significance was defined at a p-value of ≤ 0.05. A 95% confidence interval (CI) was calculated for a proportion using Wilson's method for small samples.[9] Based on their clinical presentation, women were grouped into one of five categories: (a) lower abdominal (pelvic) pain; (b) abnormal vaginal bleeding (menorrhagia, irregular, inter- and post-coital bleeding); (c) abnormal vaginal discharge (malodour, increased volume, altered colour); (d) asymptomatic women attending for infertility assessment; and (e) women attending for contraception, pre-operative assessment and urogynaecological symptoms. Men were categorised into two groups- those with urethral discharge/dysuria syndrome and those with other presentations covering asymptomatic, scrotal or abdominal pain, haematuria, investigation of fever and not specified. Data collection was affected by clinical and laboratory resources diverted to managing the on-going COVID-19 pandemic. These resource limitations meant that we were unable to collect and collate more data for women presenting before 2020.

The study was approved by the Medical Research Ethics Committee (MREC), College of Medicine and Health Sciences.

Results

Female patients

A total of 416 women attended with genital or gynaecological symptoms including infertility in 2020. Eight women were excluded from the study because they were either pregnant (5) or had invalid test results (3), leaving 408 women for study (Table 1).

Most women (235/408, 57.6%) attended the gynaecology clinic, 159 (39.0%) attended the infertility clinic and the remaining 14 (3.4%) women attended other clinical services (Accident & Emergency (13), General medicine clinic (1)).

Chlamydia was detected in 9 women (9/408, 2.4%); one woman was diagnosed with gonorrhoea alone (0.25%), with one woman dually infected. Lower abdominal (pelvic) pain and abnormal vaginal bleeding presentations accounted for most infections (Table 2, Part A). Women aged 26-35 years had the highest prevalence of chlamydial infection (7/10 (70%), Figure 1); more infections were identified in women aged ≤ 35 than > 35 years (Chi-square = 7.83, p = 0.0051. Significant at p <.05. Odds ratio 11.30, 95% CI 1.4-89).

Male patients

We collected data on 99 men who attended SQUH and tested for gonorrhoea and chlamydia between 2015 – 2020. Ten patients were excluded because of invalid NAAT test results and data for the remaining 89 men were analysed (Table 1). Most patients (52%) presented with urethral discharge/dysuria syndrome. Chlamydia was detected in eight men (9.0%) and gonorrhoea in six (6.7%); there were no dual infections (Table 2, Part B). Although tests on men were ordered from a wider range of clinics, with most tests coming from Infectious diseases (22) and General medicine (21) clinics, disproportionately more infections were identified in men attending Accident & Emergency (2/3, 67%), Student Health (3/6, 50%) and Family practice clinics (4/18, 22%). Compared to women, infections appeared to occur in younger men (Figure 1) but between group comparisons were not possible because of the modest sample size of men.

Discussion

This study describes the relative prevalence of two important curable STIs in symptomatic patients presenting to a tertiary hospital in Muscat, Oman. The commonest presentation in symptomatic women was lower abdominal pain, a cardinal feature of pelvic inflammatory disease (PID) and associated with a 17% risk of infertility after one episode.[10] Although the prevalence of infection was highest for this symptom in women, it was not significantly different from other presentations in this cohort and suggests that symptoms alone are not sufficiently sensitive or specific to reliably identify an STI (Figure 2). Given the significant caseload attributed to chlamydial infection, the study illustrates the importance of widening access to STI diagnostics beyond clinic-based syndromic case management to screen for infections before complications such as PID develop. The cost-effectiveness of such a strategy will, however, depend on the local prevalence of these infections, how they present and the behavioural characteristics of the local population.

In our female cohort, age ≤ 35 years was identified as a significant STI risk factor and consistent with epidemiological studies demonstrating a higher risk in younger women.[11,12,13] However, age may also be a confounder linked to other social, cultural, or behavioural factors such as duration of relationship, partner behaviour and condom use that will require analysis in a prospective study.

The much higher prevalence of gonorrhoea in men (6.7% vs. 0.5% in women) could be explained by the self-selection of men with more symptomatic infections, as male gonococcal urethritis tends to produce a more vigorous inflammatory response than a corresponding gonococcal urethritis or cervicitis in women, which can often be asymptomatic or associated with non-specific symptoms. In contrast, the smaller size of the male cohort may reflect disproportionately more symptomatic men electing to seek acute care elsewhere (possibly private clinics) for reasons of confidentiality. The observations support the need for a prospective multi-centre study incorporating other providers of STI care and completion of an anonymised patient questionnaire to identify risk behaviours that may explain these differences.

The study has several limitations. The patients included in the study were those that chose to seek healthcare for their symptoms from one provider (SQUH) in Muscat and

may not be representative of patients living elsewhere or accessing other providers. As with any retrospective study, there are also inherent biases that may hinder the applicability of our findings to the wider population. Recording particular symptoms (and not recording others) by the attending clinician could lead to selection bias in the outcome. Misclassification bias could have occurred when data were abstracted from the clinic records. A further consideration is that many different clinicians (especially for men) were involved in patient care, so the recording of symptoms as risk factors would be less accurate than that achieved with a prospective cohort study.

Conclusion

This exploratory study has provided insight into the relative prevalence of two common STIs and their presentations. Our findings support age-targeted culturally appropriate prevention and education strategies, as well as broadening the availability of STI diagnostic tests to detect asymptomatic sexually transmitted infections, especially in women. The study has also highlighted the need in Oman for a multi-sectoral approach involving all providers to enable comprehensive STI surveillance.

Authors' Contribution

ZAM, RL and ZAH designed the study; AAB and AAS retrieved and collated clinical and laboratory data. All the authors were responsible for drafting and critical appraisal of the manuscript. All authors approved the final version of the manuscript.

Conflict of interests

The authors declare no conflicts of interest.

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Table 1: Sociodemographic factors of patients attending SQUH who were tested for chlamydia and gonorrhoea in 2020 (women) and between 2015 - 2020 (men).

	Female (N = 408)	**Male (N = 89)**
Omani nationality (%)	394 (96.6%)	84 (94.4%)
Age distribution		
Mean	36.5 years	33.8 years
Median	35.95 years	31.2 years
Range	16.5 – 66.7 years	14.3 – 81.1 years
Marital status (%)		
Married	398 (97.5%)	39 (43.8%)
Divorced	5 (1.2%)	-
Widowed	4 (1.05%)	-
Single	1 (0.25%)	35 (39.3%)
Not disclosed	-	15 (16.9%)

Table 2: Main symptom or presentation and detection of gonorrhoea and chlamydia in women (Part A) and men (Part B).

Main symptom or presentation	**Totals**	**Chlamydia & Gonorrhoea negative**	**Chlamydia positive only**	**Gonorrhoea positive only**	**Chlamydia & Gonorrhoea positive**
Part A. Women	**408**				
Lower abdominal pain	55	50	4	0	1
Abnormal vaginal bleeding	40	38	2	0	0
Abnormal vaginal discharge	42	40	1	1	0

Infertility assessment	165	163	2	0	0
Others	106	106	0	0	0
Part B. Men	**89**				
Urethral discharge and/or dysuria	44	31	8	5	0
Others	45	44	0	1	0

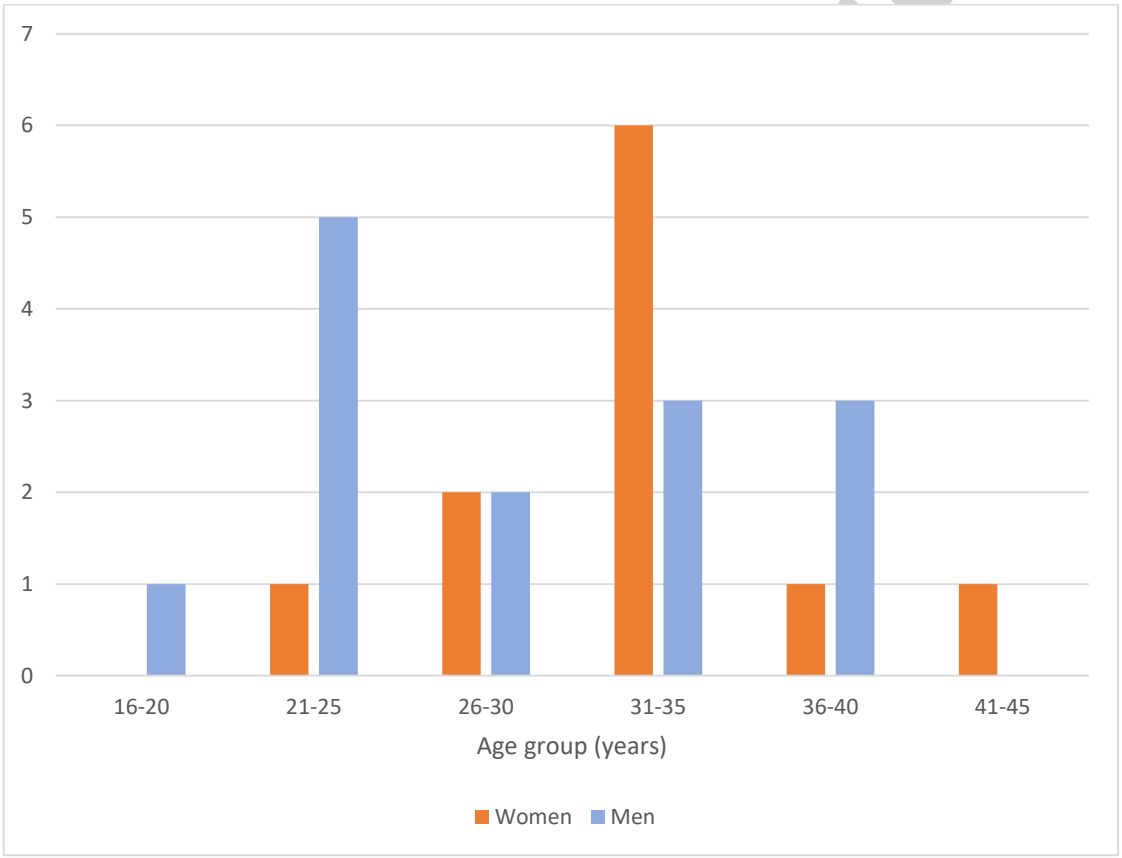

Figure 1: Distribution of chlamydia and gonorrhoea cases by age and gender.

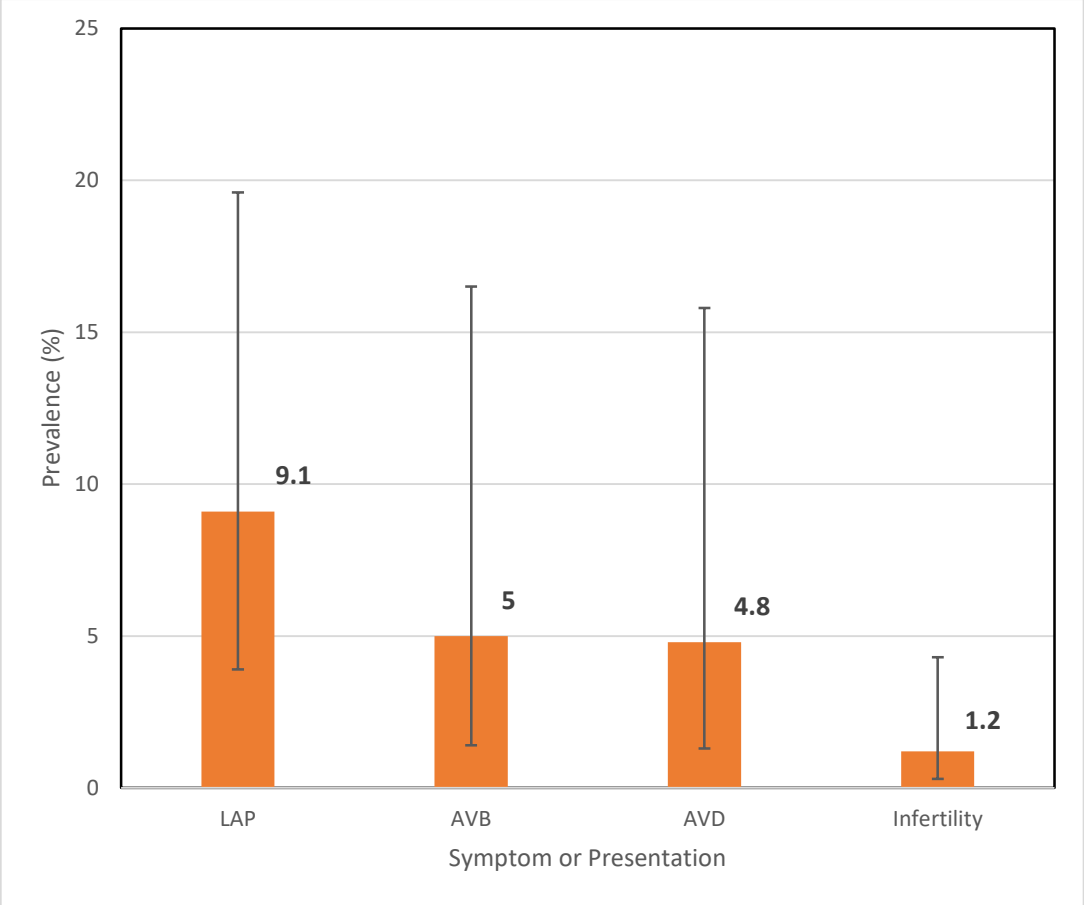

Figure 2: Prevalence of chlamydial infection (%) with 95% confidence intervals in women presenting with lower abdominal pain (LAP), abnormal vaginal bleeding (AVB), abnormal vaginal discharge (AVD) and infertility.