



Antibiotic susceptibility patterns of *Neisseria gonorrhoeae* isolates in Port Elizabeth

S Govender, T Lebani, R Nell

Objective. To survey the antibiotic susceptibility of *Neisseria gonorrhoeae* isolates.

Design. This was a cohort analytical study.

Setting. Three clinics serving different areas in Port Elizabeth.

Outcome measures. Prevalence of antibiotic-resistant *N. gonorrhoeae* isolates.

Results. Twenty-one of the 35 isolates (60%) were resistant

to ciprofloxacin, while 28 (80%) showed resistance to erythromycin, 17 (48.6%) to penicillin, 3 (8.6%) to doxycycline, 11 (31.4%) to spectinomycin and 33 (94.3%) to tetracycline.

Conclusion. To ensure effective treatment of gonorrhoea, continued surveillance of antimicrobial susceptibility is necessary.

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The control of gonococcal infection is important given the high incidence of acute infections, complications and sequelae and the role of gonococci in HIV acquisition and transmission. Knowledge of antimicrobial susceptibility of *Neisseria gonorrhoeae* isolates is a prerequisite for proper treatment and control of the disease. However, emergence of resistance to antimicrobial agents in *N. gonorrhoeae* isolates resulting from both wide dissemination of resistant clones and the emergence of strains with novel resistance mechanisms is a major obstacle in the control of gonorrhoea.¹ Antimicrobial resistance in *N. gonorrhoeae* isolates is caused by chromosomal mutations or by the acquisition of plasmids carrying resistance determinants to penicillin or tetracycline,^{2,3} and strains can often have a multiple resistance phenotype. To prevent treatment failures, continuous surveillance of trends in gonococcal resistance to antimicrobials is imperative. The present study was designed to ascertain the current status of antimicrobial susceptibility patterns and plasmids from *N. gonorrhoeae* isolates in clinics in Port Elizabeth.

Methods

A nurse took urethral and vaginal swabs from consenting male and female patients at 3 clinics serving different areas in Port Elizabeth. A total of 80 swab samples were obtained from male patients with urethral discharge, dysuria or burning on micturition, and female patients with vaginal discharge. Swabs were streaked directly onto New York City agar plates, inverted in a candle extinction jar and incubated at 37°C for 48 hours.

Department of Biochemistry and Microbiology, Nelson Mandela Metropolitan University, Port Elizabeth, E Cape

S Govender, MSc (Microbiol)
T Lebani, BSc Hons (Microbiol)
R Nell, BSc Hons (Microbiol)

Corresponding author: S Govender (sharlene.govender@nmmu.ac.za)

Cultures were identified using Gram stains, and catalase, oxidase and carbohydrate fermentation tests.

Antibiotic susceptibility tests were performed on all isolates using the Kirby-Bauer disk diffusion method. Discs containing ciprofloxacin (5 µg), doxycycline (30 µg), erythromycin (15 µg), penicillin (10 U), spectinomycin (10 µg) and tetracycline (5 µg) were used and isolates incubated onto blood Diagnostic Sensitivity Test agar. After 24-hour incubation in a candle extinction jar at 37°C, zone sizes were compared with those of published data^{4,5} and categorised as susceptible, intermediate or resistant.

All confirmed *N. gonorrhoeae* isolates were tested for β-lactamase production using β-lactamase identification strips (Oxoid Ltd, Hampshire, UK) to detect penicillinase-producing *N. gonorrhoeae*.

Results

Although 80 swab samples were analysed during 2003 and 2004, only 35 were found to be positive for *N. gonorrhoeae*. Of these, 10 isolates (28.6%) were obtained from clinic A, 22 (62.8%) from clinic B and 3 (8.6%) from clinic C. Twenty of the 35 isolates (57.1%) were from patients who did not use any protection, while 42.9% of the isolates were from patients who had multiple sexual partners. Patients were aged from 16 to 49 years, with the majority of samples (57.1%) obtained from patients in the 16 - 21-year age group followed by the 22 - 25-year age group (25.7%) and the 26 - 49-year age group (17.2%).

Table I indicates that 21 *N. gonorrhoeae* isolates (60%) were found to be resistant, with 31.4% partially susceptible and 8.6% susceptible. Doxycycline sensitivity testing revealed that 91.4% were susceptible and 8.6% resistant. Eighty per cent of isolates were resistant to erythromycin, 17.1% partially susceptible and 2.9% susceptible. With regard to penicillin 48.6% of isolates were resistant and 51.4% partially susceptible. Fourteen penicillinase-producing *N. gonorrhoeae* strains were detected.

**Table I. Antimicrobial susceptibility pattern of *N. gonorrhoeae* isolates (N = 35) by disc diffusion method**

Antibiotic	Number (%) of isolates		
	Susceptible	Intermediate	Resistant
Ciprofloxacin	3 (8.6)	11 (31.4)	21 (60)
Doxycycline	32 (91.4)	-	3 (8.6)
Erythromycin	1 (2.9)	6 (17.1)	28 (80)
Penicillin	-	18 (51.4)	17 (48.6)
Spectinomycin	16 (45.7)	8 (22.9)	11 (31.4)
Tetracycline	-	2 (5.7)	33 (94.3)

For spectinomycin, 45.7% of isolates were susceptible, 22.9% partially susceptible and 31.4% resistant. It was shown that 94.3% of isolates were resistant to tetracycline, while 5.7% were partially susceptible.

Discussion

Antimicrobial-resistant *N. gonorrhoeae* is an increasing and costly health problem and occurs mainly because of inappropriate therapy, self-medication and poor compliance.⁶ It has been suggested that only a fraction of sexually transmitted infections (STIs) in developing countries are treated sufficiently. Women are often carriers of the disease, since a large percentage of infected women are asymptomatic, while the STI remains undetected and untreated.⁷

In this study, 80 swab samples were analysed; however only 35 (44%) were confirmed to be positive for *N. gonorrhoeae* and few samples were obtained from females. This is because of the variety of discharges in female patients accompanied by contamination with normal genital tract microflora during isolation procedures. Frequent workshops attended by nurses and the community have addressed dangers of unprotected sex. However, this study revealed that a high percentage of patients did not use any protection owing to irresponsible behaviour and intoxication.

It is acknowledged that the sample size in the study was too small for any generalised conclusions to be drawn. Nevertheless, there seems to be a high prevalence of penicillin and tetracycline, resistance which may indicate acquisition of genes from other organisms or the introduction of an already resistant gonococcal strain that takes advantage of the selective environment created by the syndromic management.^{5,8,9} In addition, since differentiation between gonorrhoea and chlamydial infection is not made in the syndromic protocol used by the clinics, all patients with gonorrhoea are exposed to tetracycline, thereby enhancing resistance. The high number of isolates showing erythromycin resistance may be as a result of increased exposure during treatment of genital ulcer disease and vaginal discharge in pregnancy. In contrast, the high sensitivity (91.4%) of isolates to doxycycline may be due to

simultaneous administration of ciprofloxacin and doxycycline to patients at the clinics visited.

This study revealed that 45.7% of isolates were sensitive to spectinomycin although it is infrequently used for treatment of vaginal discharge in pregnancy. The high percentage (60%) of isolates that showed resistance to ciprofloxacin is of concern as ciprofloxacin is used as first-line therapy for *N. gonorrhoeae* since the introduction of syndromic

management guidelines.⁵ Furthermore, fluoroquinolone resistance in *N. gonorrhoeae* has been reported in some parts of the world¹⁰⁻¹² and has started to emerge in others.^{13,14} Also, studies in Durban have indicated that there is an increase in the number of patients with discharge syndrome who fail to respond to treatment with ciprofloxacin.¹⁵ It must be noted that this survey was conducted mainly in the context of research settings and was not part of an STI control programme at clinics in Port Elizabeth. However, it emphasises the urgent need for periodic surveillance of antimicrobial susceptibility of *N. gonorrhoeae* isolates at clinics in Port Elizabeth.

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