ANTIMICROBIAL SUSCEPTIBILITY OF *NEISSERIA GONORROHEA* IN KUMASI

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SUMMARY

Between January - December 1992, three hundred and fifty six (356) isolates of *Neisseria gonorrhoeae* from clinical material were subjected to antimicrobial susceptibility testing in the Clinical Microbiology Laboratory of the Komfo Anokye Teaching Hospital, Kumasi.

Ceftriaxone, Cefuroxime, and Norfloxacin showed high activity against the gonococcus (95-100% sensitivity). Seventy-eight per cent (78%) of the isolates were sensitive to Spectinomycin. A low activity was exhibited by the commonly used antimicrobials, i.e. Penicillin 8.5%, Tetracycline 2.5%, Cotrimoxazole 3%, Erythromycin 8.5%, and Chloramphenicol 10%.

Key Words *Neisseria gonorrhoeae*, antimicrobials, antimicrobial susceptibility testing.

INTRODUCTION

Gonorrhoea continues to be the most common male presenting sexually transmitted disease (STD) in the developing world¹. It is a major health problem which if left untreated or inadequately treated may lead to devastating consequences including Pelvic Inflammatory Disease (PID), infertility, chronic pelvic pain, and urethral stricture³.

Before 1976, gonococcal isolates were sensitive to penicillin. Penicillinase producing *Neisseria gonorrhoea* (PPNG) first emerged in West Africa and South East Asia in 1976². PPNG produce β-lactamases which greatly reduce the efficacy of the penicillins by destroying the β-lactam ring of the penicillins. PPNG incidences between 30-50% have been reported from Singapore, Thailand, Nigeria, Rwanda and Durban²,⁷.

The property of β-lactamase production is plasmid mediated. Recently, there have been reports of penicillin resistance via chromosomal mediation³,⁸,⁹. Such gonococci have been called chromosomally mediated resistant *Neisseria gonorrhoeae* (CMRNG). Reports of antibiotic resistance of *N. gonorrhoeae* have not been limited to penicillin. Resistance to the tetracyclines, co-trimoxazole, thiamphenicol, and kanamycin have also been reported⁶,⁹.
This study reports the in-vitro susceptibility of 356 isolates of N. gonorrhoeae to 9 antimicrobials. The implications of this to Health Care delivery in the country is discussed.

MATERIALS AND METHODS

Clinical specimens (urethral smears, endocervical smears, high vaginal swabs and conjunctival exudates) taken in the clinical microbiology laboratory (from patients referred from Private clinics and Urban Health centres) or received from other Departments in the Hospital between January - December 1992, were plated on chocolate agar and incubated at 37°C in carbon dioxide jars for 24-48 hours. After incubation, N. gonorrhoeae were identified by typical colonial morphology, Gram stain, oxidase reaction, and acidification of glucose but not maltose, lactose or sucrose. Production of b-lactamase was not tested.

Antimicrobial susceptibility testing (AST) was carried out on all isolates on chocolate agar by the disc diffusion method\textsuperscript{11}

The antibiotics tested were penicillin (2U), tetracycline (30mcg), cotrimoxazole (25 mcg), chloramphenicol (30 mcg), erythromycin (15 mcg), norfloxacin (10 mcg), spectinomycin (100 mcg), cefuroxime (30 mcg), and ceftriaxone (30 mcg).

RESULTS

Table 1 shows the clinical specimens from which N. gonorrhoeae was isolated. The majority of isolates were from urethral smears (121). Others were endocervical smears (96), High vaginal swabs (87), and conjunctival exudates (52).

Table 2 shows the results of the sensitivity testing of the 356 isolates to the 9 antimicrobials. Ceftriaxone, cefuroxime, and norfloxacin showed high activity against the gonococcus (95-100% sensitive) with spectinomycin following with 78%.

**Table 1:** Clinical Specimens from which N. gonorrhoeae was isolated

<table>
<thead>
<tr>
<th>SPECIMEN</th>
<th>NUMBER OF ISOLATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urethral Smears</td>
<td>121</td>
</tr>
<tr>
<td>Endocervical Smears</td>
<td>96</td>
</tr>
<tr>
<td>High Vaginal Swabs</td>
<td>87</td>
</tr>
<tr>
<td>Conjunctival Exudates</td>
<td>52</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>356</td>
</tr>
</tbody>
</table>

**Table 2:** Antimicrobial Susceptibility Test Results of the Isolates of N. gonorrhoeae to 9 Antimicrobials

<table>
<thead>
<tr>
<th>Antimicrobial Agent</th>
<th>No. of Isolates Tested</th>
<th>No. Sensitive to Antimicrobial</th>
<th>Percentage Sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>356</td>
<td>30</td>
<td>8.5</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>356</td>
<td>9</td>
<td>2.5</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>356</td>
<td>11</td>
<td>3.0</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>250</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>356</td>
<td>30</td>
<td>8.5</td>
</tr>
<tr>
<td>Norfloxacin</td>
<td>310</td>
<td>301</td>
<td>97</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>240</td>
<td>187</td>
<td>78</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>253</td>
<td>240</td>
<td>95</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>270</td>
<td>270</td>
<td>100</td>
</tr>
</tbody>
</table>
A high degree of resistance was exhibited to the commonly used antimicrobials, i.e. Penicillin 91.5%, Tetracycline 97.5%, Cotrimoxazole 97%, and Chloramphenicol 90%. Only 8.5% of the isolates were sensitive to the macrolide, erythromycin.

**DISCUSSION**

The results depict the present trend of multi-resistant *Neisseria gonorrhoeae* that have been reported from various parts of the world. In concordance with reports from other African countries, and South East Asia, this study shows a high level of penicillin resistance (91%).

Tetracycline is one of the antibiotics that has been used as a single agent in the treatment of gonococcal and non-gonococcal urethritis. In recent years, increased chromosomal and plasmid mediated resistance to tetracycline has been found in *N. gonorrhoeae* strains in African countries, in the US, Canada, the Netherlands, England and France. Ninety-seven per cent (97%) of our isolates were resistant to tetracycline, a figure higher than has been reported from the countries above.

Gonococcal susceptibility to cotrimoxazole in this report is similar to that of tetracycline (3%). In a study from Central Africa only 11% of isolates were sensitive to cotrimoxazole. It is not unusual to have this level of resistance to tetracycline and cotrimoxazole and also penicillin as these antimicrobials are among the commonly abused antibiotics in this country, thus favouring resistance development. These antibiotics can easily be obtained over the counter and most patients with urethral discharges take them in various inappropriate dosages before reporting to the hospital when symptoms do not subside (personal observation).

In contrast to findings from Durban, South Africa*, 91.5% of our isolates were resistant to erythromycin and chloramphenicol respectively. All gonococcal isolates from Durban have been reported to be highly sensitive to these drugs. Our results however, are in consonance with the situation in South East Asia and Nigeria (erythromycin was not tested in this study). This may be due to similarities in some of the plasmid profiles of the gonococcus in West Africa and South East Asia.

Antimicrobials recommended by the World Health Organisation for the treatment of gonococcal infections include ceftriaxone, spectinomycin, and the quinolones. In this study no in-vitro resistance was detected to ceftriaxone. Another cephalosporin tested, cefuroxime, exhibited high activity against the gonococcus (240 out of 253 isolates tested were sensitive). Similar results have been reported from many countries.

The quinolone, norfloxacin, had a higher in vitro activity against *N. gonorrhoeae* than spectinomycin. Twenty two per cent (22%) of isolates were resistant to spectinomycin. In the immediate PPNP era, spectinomycin had a high activity against the gonococcus. It is still highly effective in some countries. Emergence of resistance has been reported from countries including UK, Thailand, Singapore, and the US. This study shows it is not the most efficacious antibiotic in the country presently against *N. gonorrhoeae*.

The susceptibility pattern of the gonococcus to antimicrobials as shown in this study grave implications for Health Care delivery in the country. At the Primary Health Care level (levels A and B) where about 68% of the population receive initial health care, the prescribable antibiotics in their arsenal (the essential drug list) does not include those with high activity against the gonococcus, i.e. ceftriaxone, cefuroxime, and norfloxacin. These health facilities stock mainly the penicillins, tetracyclines,
citravoxazol, chloramphenicol, and others with little or no activity against *N. gonorrhoeae*. Secondly, the more efficacious antimicrobials are expensive and health centres may not be able to stock them. It is necessary that a system is adopted to make these antimicrobials available at the level A and B stations, as untreated or poorly treated gonococcal infections bring in their wake serious sequelae. With increasing reports that the presence of a sexually transmitted disease enhances the acquisition and dissemination of the Human Immunodeficiency Virus (HIV), our attempts at controlling the HIV/AIDS epidemic may be hampered by inadequate therapy of gonococcal infections.

With the changing pattern of antimicrobial susceptibility of *N. gonorrhoeae* it is important that surveillance systems are put into place to monitor these changes. In Ghana presently, a proper STD surveillance system is not in place and it is time this is done.

**ACKNOWLEDGEMENTS**

I am grateful to Dr. Osei Tutu Owusu of the Department of Medicine, Komfo Anokye Teaching Hospital, for his support and for reviewing the manuscript. My thanks also to the following representatives of Drug firms who supplied some of the Antibiotic discs; Mr. I. Bohulu (Hoffman La Roche), Mr. S. Nkansah (Glaxo), Mr. E. Acquah (MSD) and Mr. L. Nortey (Upjohn).

**REFERENCES**


