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ANTIMICROBIAL SUSEPTIBILITY OF *NEISSERIA GONORRHOEAE* ISOLATED FROM PATIENTS ATTENDING VARIOUS CLINICS IN PAMBEGUWA, KADUNA STATE.**Jatau, E. D. and Inabo*, H. I.**Department of Microbiology, Faculty of Science,
Ahmadu Bello University, Zaria, Nigeria.**E-mail:** heleninabo@yahoo.co.uk**Abstract**

Antimicrobial resistant strains of gonococcal isolates have spread in many developing countries. In most African countries, the susceptibility of *Neisseria gonorrhoeae* is rarely tested. The antimicrobial susceptibility of one hundred and eight (108) *Neisseria gonorrhoeae* was therefore determined. Of the 108 isolates tested, 80 (74.07%) were resistant to penicillin, 74 (68.5%) were resistant to ampicillin. The resistance profiles for the remaining antibiotics tested were as follows: Erythromycin (58.3%), Tetracycline (62%) and gentamicin (25.9%). All the isolates were susceptible to ceftriaxone, cefuroxime and ofloxacin. Of the 80 penicillin resistant strains, 65 (81.3%) were penicillinase producing *Neisseria gonorrhoeae* (PPNG). The Minimum Inhibitory Concentration (MIC) of Penicillin against 9 gonococcal isolates, Ampicillin against 5 *Neisseria gonorrhoeae* isolates and Tetracycline against 2 gonococcal isolates was 32.0µg/ml. A total of 108 isolates were susceptible to 0.125µg/ml of ceftriaxone, cefuroxime and ofloxacin respectively. The high prevalence of PPNG and multiple drug resistance strains of *Neisseria gonorrhoeae* is associated with self-medication and sexual interaction between commercial sex workers (CSWs) resident in Pambeguwa and the long-distance truck drivers. Antimicrobial susceptibility test should be carried out on every gonococcal isolate obtained to ensure effective therapy. The present study was undertaken to assess the antimicrobial susceptibility of gonococcal isolates recovered from patients in Pambeguwa, Kaduna state, Nigeria.

Key words: *Neisseria gonorrhoeae*, antimicrobial susceptibility, long-distance truck drivers**Introduction**

The emergence of antimicrobial resistant strains of *Neisseria gonorrhoeae* in the 1970's has been an important obstacle in the treatment and control of gonorrhoea (Ashford et al., 1976; Macomber et al., 2005; Roy et al., 2005). The Centre for Disease Control and prevention (CDC) and World Health Organisation (WHO) have approved the use of fluoroquinolones and third generation cephalosporins for the treatment of gonococcal infections worldwide (WHO, 1989; CDC, 2002). The spread of such antimicrobial resistant strains from endemic areas to low-incidence areas has been associated with intra- and inter-national travelers (Etkind et al., 2003; Gushulak and Macpherson, 2004; Fenner et al., 2007). The origin of penicillinase producing *Neisseria gonorrhoeae* strains were traced to Far East Asia and parts of West Africa (Krieger, 1984). In 1990, the prevalence of quinolone resistant *Neisseria gonorrhoeae* strain was well-established in Hong Kong, Japan, Philippines and Thailand. The importation of quinolone resistant *Neisseria gonorrhoeae* (QRNG) strains was associated with travels to Asia (Macomber et al., 2005).

In Nigeria Odugbemi (1987) estimated that PPNG composed 70-80% of all gonococcal isolates. Bakare (1996) reported that 59(92%) of 64 *Neisseria gonorrhoeae* isolates obtained from male patients at special treatment clinic, University College Hospital, Ibadan were penicillinase producing *Neisseria gonorrhoeae* (PPNG).

In a related study, Jatau et al. (2003) reported that 189 (84%) of 225 penicillin resistant *Neisseria gonorrhoeae* isolates obtained from various parts of Kaduna state were PPNG. The prevalence rate of 82.3% has also been reported in Kaduna metropolis. (Jatau, 2005).

We decided to determine the antimicrobial susceptibility patterns of clinical *Neisseria gonorrhoeae* isolates obtained from attendees of various clinics in Pambeguwa because of its strategic location on Jos-Kaduna highway, Nigeria, where long distance truck drivers do stop over in the course of their journeys. These drivers may be incriminated in the spread of antimicrobial resistant sexually transmitted infections particularly gonorrhoea as they are known to have intimate relationships with commercial sex workers.

Materials and Methods

One hundred and eight (108) clinical strains of *Neisseria gonorrhoeae* were isolated from 39 female and 69 male patients presenting symptoms of cervicitis and urethritis. These patients were attending various clinics in Pambeguwa (a small junction town 80 kilometres from Zaria on Kaduna-Jos highway). The isolates were tested for their susceptibility patterns against eight antimicrobial agents using the Bauer- Kirby agar diffusion method. The specimens were collected between 1st January, 2006 and 1st June, 2006. The antibiotics used were penicillin G (2.4 i.u), tetracycline (10µg), ampicillin (10µg), erythromycin (5µg), ofloxacin (10µg), gentamicin (5µg), ceftriaxone (0.µ1g) and cefuroxime (10µg).

The antimicrobial discs were purchased from Oxoid, Unipath U.K and the reference *Neisseria gonorrhoeae* strains were obtained from WHO collaborating center for Reference and Research in Gonococci, Copenhagen, Denmark. An inoculum of 10⁹ colony forming units (cfu) of each isolate was made from a 24 -hour culture on Modified Thayer Martin (MTM) agar plate and inoculated on a fresh sterile MTM agar plate. The inoculated plates were left at room temperature for 10minutes before antimicrobial discs were aseptically placed on them. The inoculated plates were incubated in an atmosphere of 5% carbon dioxide at 36⁰C for 24hrs. The zones of inhibition were measured and interpreted using the NCCLS guidelines. Rapid iodometric method was used to detect the beta-lactamase production (CLIS, 2005) The minimum inhibitory concentration (MIC) of penicillin G, Ampicillin, tetracycline, erythromycin, gentamycin, ceftraoxone, cefuroxime and ofloxacin on each isolate were determined (Kenny and Brachman, 1994).

Results

Our findings showed that 80(74.07%) were resistant to penicillin, of which 65(81.3%) were beta-lactamase producers (PPNG). The remaining 15 (18.7%) were non-penicillinase negative *Neisseria gonorrhoeae* (NPPNG).

The resistance profiles of the isolates to the antibiotics used were: Ampicillin (n =74; 68.5%), tetracycline (n =63; 58.3%), erythromycin (n =63; 58.3%) and gentamicin (n =28; 25.9%). All the 108 isolates of *Neisseria gonorrhoeae* were highly sensitive to cefuroxime, ceftriaxone and ofloxacin. The susceptibility patterns of these isolates to antimicrobial agents are shown in Table 1. The minimum inhibitory concentration (MIC) of penicillin, ampicillin and tetracycline were higher than 0.125µg/ml. Penicillin, ampicillin and tetracycline had MIC of 32.0µg/ml against 9, 5, 2 isolates of *Neisseria gonorrhoeae* respectively.

The MICs of antimicrobial agents employed as the primary therapeutic drugs for gonorrhoea were high. (Table 2).

Discussion

Antimicrobial susceptibility patterns of the *Neisseria gonorrhoeae* strains showed high resistance to the first line therapeutic agents commonly used for the treatment of gonorrhoea. The findings of our study have shown 74.07%, 68.5%, 62% and 58.3% resistance to penicillin, ampicillin, tetracycline and erythromycin respectively. These antibiotics are used as first-line therapy by most clinicians.

The high antimicrobial resistance of *Neisseria gonorrhoeae* is in agreement with earlier reports (WHO, 1997 and 2000; Jatau, 2005). However, the rates are not as high as those reported in Surabaya, Indonesia where resistance to penicillin and tetracycline were 89% and 98% respectively (Joesoef *et al.*, 1994).

The high prevalence rate (81.3%) of PPNG confirmed reports that PPNG composed 70-80% of all

Table 1. Antimicrobial susceptibility of *Neisseria gonorrhoeae* isolates (n = 108)

Antibiotic/Concentration	No and % of sensitive isolates	No and % of resistant isolates
Penicillin G (2.4 i.u)	28 (25.9)	80 (74.07)
Ampicillin (10µg)	34 (31.5)	74 (68.5)
Tetracycline (10µg)	41 (38.0)	67 (62.0)
Erythromycin (5µg)	45 (41.7)	63 (58.3)
Gentamicin (5µg)	80 (74.07)	28 (25.9)
Ceftriaxone (0.1µg)	108 (100)	0 (0)
Cefuroxime (10µg)	108 (100)	0 (0)
Ofloxacin (10µg)	108 (100)	0 (0)

Table 2: Minimum inhibitory concentration of antimicrobial agents tested against *Neisseria gonorrhoeae* isolates.

Antibiotic	% of isolates with MIC values mcg/ml			
	0.125	>0.125	>32	Total
Penicillin G	0.0	91.7	8.3	100
Ampicillin	0.0	95.4	4.6	100
Tetracycline	0.0	98.2	1.8	100
Erythromycin	0.0	100	0.0	100
Gentamicin	0.0	100	0.0	100
Ceftriaxone	100	0.0	0.0	100
Cefuroxime	100	0.0	0.0	100
Ofloxacin	100	0.0	0.0	100

Neisseria gonorrhoea isolates (Odugbemi, 1984; Bakare *et al*, 1996; Jatau, 2005).The antimicrobial susceptibility patterns of the gonococcal isolates showing the prevalence rates of PPNG and NNPNG have also agreed with previous reports that antimicrobial resistance among *Neisseria gonorrhoeae* is both chromosomally and plasmid mediated (Clendennen *et al.*, 1992; Rice and Knapp, 1994).

The susceptibility of the 108 gonococcal strains to ceftriaxone, cefuroxime and ofloxacin is contrary to the reports from the Far East Asia and the U.S.A that there is high prevalence rate of quinolone resistant *Neisseria gonorrhoeae* (QRNG) (CDC, 2002; Macomber *et al.*, 2005; Sethi *et al.*, 2006). Increased prevalence of QRNG strains in California and Hawaii, U.S.A led the CDC to recommend that fluoroquinolones should not be used for treatment of gonococcal infection acquired from such areas (CDC, 2002).

The high cost of quinolones and newer antimicrobial agents has made it almost impossible for purchase by the patients in this study area even when prescribed and also discouraged their use for self medication. The high prevalence of multiple drug resistant *Neisseria gonorrhoeae* strains found in this study is attributed to self medication resulting from use of underdose of the antibiotics. The multiple drug resistance of the isolates may be attributable to the sexual interaction of Commercial Sex Workers (CSW) with the long distance truck drivers who either transmit the strain or be infected with it. There is a need for clinicians to obtain the travel history of patients suspected of having gonorrhoea. This will aid in the selection of the appropriate antibiotics for treatment. The use of microscopic diagnosis of gonorrhoea impedes the monitoring of antimicrobial resistance. It is imperative that clinicians should request for the culture and antimicrobial susceptibility of specimens positive for *Neisseria*

gonorrhoeae by microscopy.

Conclusion

It is clinically important that every gonococcal isolate obtained from such areas be subjected to antimicrobial susceptibility testing to ensure effective treatment and control of the disease. Periodic monitoring and surveillance of the sale and use of antibiotics by national agencies such as National Agency for Food, Drugs and Cosmetics (NAFDAC) will go a long way in curbing the drug abuse particularly antibiotics which are available over the counter.

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