

The prevalence and antibiotics susceptibility pattern of *Neisseria gonorrhoeae* in patients attending OPD clinics at St. Mary's Hospital Lacor Uganda

P. AMITO FLORENCE¹, F. OTIM², F. OKONGO³, M. OGWANG⁴, D. GRECO⁵

¹Department of Microbiology, St. Mary's Hospital Lacor, Gulu, Uganda; ²Department of Immunology, St. Mary's Hospital Lacor, Gulu, Uganda; ³Department of Research and Documentation, HIV/AIDS and Palliative Care, St. Mary's Hospital Lacor, Gulu, Uganda; ⁴Department of Surgery, St. Mary's Hospital Lacor, Gulu, Uganda; ⁵National Institute of Health, Rome, Italy

Key words

Gonorrhea • Antimicrobial resistance • Uganda

Summary

Introduction. *Gonorrhea* is one of the most common sexually transmitted infections (STIs) in developing countries, and the emergence of resistance to antimicrobial agents in *Neisseria gonorrhoeae* is a major obstacle in the control of gonorrhoea. Periodical determination of the prevalence and monitoring of antimicrobial susceptibility of *N. gonorrhoeae* is essential for the early detection of emergence of drug resistance.

Methods. A total of 640 consecutive patients who attended the Outpatient Department (OPD) Clinics at St. Mary's Hospital Lacor between Jan 2007-Dec 2011, with gonococcal urethritis symptoms and whose urethral swabs and high vagina swabs (HVS) were cultured, were involved in the study. Two hundred and fifty six (256) patients had positive pus swab culture, of which 151 (23.6%) showed growth of *Neisseria gonorrhoeae*. All the isolates were tested for antimicrobial susceptibility using the Kirby Bauer-Disc diffusion techniques.

Results. Gonococcal isolates showed rapid decrease in susceptibility to the antimicrobials especially to Ampicillin, Tetracycline and Erythromycin, Ciprofloxacin, and intermediate to chloramphenicol, however, Gentamicin and cefotaxime have remained as a single dose sensitive treatment for *Neisseria gonorrhoeae*. Sensitization on drug use and adopting preventive measures and continuous education on safer sexual behavior through health care authorities would lead to reduction in the prevalence of *Neisseria gonorrhoeae* and resistance to antimicrobial.

Discussion. *Gonorrhea* is one of the most common sexually transmitted infections (STIs) in developing countries, and the emergence of resistance to antimicrobial agents in *Neisseria gonorrhoeae* is a major obstacle in the control of gonorrhoea. Periodical monitoring of antimicrobial susceptibility of *N. gonorrhoeae* is essential for the early detection of emergence of drug resistance.

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Introduction

Gonorrhoea is one of the classical sexually transmitted infections (STIs) with human as the only host for the causative agent *Neisseria gonorrhoeae* and since ancient times it continues to defy man's attempt to control it. Gonococcal infections and their complication are amongst the most frequent communicable diseases in many countries [1].

Gonococci have been adept at developing resistance to commonly used antimicrobials. Failure to cure a case of gonorrhoea has a public health implication, due to the potential for continued transmission and rapid emergence of antimicrobial resistance. The present study was done to determine the prevalence of *Neisseria gonorrhoeae*, the antibiotics susceptibility pattern and to establish the most affected age groups. Despite a sharp decline in the incidence of gonococcal infection in developed countries during the last decade, gonorrhoea still remains one of the most common STIs in developing countries and a global health problem [2]. The prevalence of gonococcal infection varies greatly among countries in the devel-

oped and developing world, the highest being in South and Southeast Asia, followed by sub-saharan Africa and Latin America where it continues to be a major public health problem. According to the World Health Organization, there are approximately 62 million new cases of gonorrhoea worldwide annually, and almost half of the cases are estimated to occur in Southeast Asia [1].

In the absence of any effective vaccine against *N. gonorrhoeae*, control of gonococcal infection mainly depends on safe sex practices and the identification and treatment of infected individuals. An early and successful anti-biotic treatment of gonococcal infection or cures of the individual patient is important in prevention of complications, and reduction of transmission [3]. Strategies for the control of gonorrhoea have relied on the use of highly-effective and often single-dose therapy administered at the time of diagnosis [4]. Information on antimicrobial susceptibility of *N. gonorrhoeae* is therefore, important for the selection of an appropriate antimicrobial agent.

The versatile nature of the gonococcus and its capacity to cope with changing conditions in micro-environment

is a major challenge in the prevention and control of gonococcal infection [5]. The continuous emergence of resistance to antimicrobial agents has made the treatment of gonorrhoea expensive, prolonged, and unpredictable. The organism acquires resistance by spontaneous mutation or by acquisition of new DNA via conjugation or transformation, and resistance may, thus, be chromosomal or plasmid-mediated. A single organism can have both the mechanisms of resistance, and resistance to multiple antibiotics is often common [6].

Antimicrobial resistance in gonococci often spreads rapidly among countries, and infected travellers often appear for treatment in countries distant from the source of infection. Hence, data on local and regional antimicrobial resistance are important for the management and treatment of gonorrhoea.

Materials and methods

A total of 640 consecutive patients who attended the Outpatient Department (OPD) Clinics at St. Mary's Hospital Lacor from Jan 2007-Dec 2011 with suspected gonorrhoea and had urethral / high vagina swabs (HVS) discharge specimens taken, were included in the study. Data on the patients was retrieved from the culture record book.

A presumptive diagnosis of gonococcal infection was made observing polymorphonuclear leucocytes (PMNLs) with gram negative intra or extracellular diplococci (ICDC /ECDC). If the smear showed four or more PMNLs with the absence of gram negative ICDC / ECDC a presumptive diagnosis of non gonococcal urethritis (NGU) was made.

The urethral /HVS discharge was plated onto Chocolate agar, incubated for 24 to 48hrs at 37°C in a 5% CO₂ atmosphere. *N. gonorrhoeae* isolates were identified by colony morphology, a positive oxidase test, a Gram stain smear with gram-negative diplococci and rapid carbohydrate utilisation. Antimicrobial susceptibility testing was performed and defined by the disk diffusion test (Kirby Bauer) as recommended by the Clinical and Laboratory Standards Institute (CLSI). Resistance profiles of all the *N. gonorrhoeae* isolates to seven antimicrobial agents (Ampicillin, cefotaxime, ceftriaxone, tetracycline, ciprofloxacin, Erythromycin and Gentamicin) were tested for by the disk diffusion test.

Results

Out of the 640 patients whose urethral swabs and HVS were cultured, 256 positive cultures (40%) out of which 151 (59%) were found to have gonococcal infection, 105 (41%) patients had other micro-organisms and 384 (60%) had no bacterial growth and contaminants (unidentified staphylococcus).

In the Table I above, a number of organisms were isolated with the most frequent being *Neisseria gonorrhoeae*, and *K.pneumoniae*, *Streptococcus* and *Escherichia coli* respectively and followed by staphylo-

Tab. I. Showing the different organisms isolated from the Urethral / HVS between Jan 2007-Dec 2011.

Organisms	Frequencies (N = 256)	Percentages (%)
<i>K. Pneumoniae</i>	25	9.7
<i>Pseudomonas</i>	3	1.2
<i>Citrobacter</i>	3	1.2
<i>N.gonorrhoeae</i>	151	59
<i>Streptococcus</i>	25	9.7
<i>Proteus mirabilis</i>	8	3.1
<i>Staphylococcus aureus</i>	8	3.1
<i>Escherichia Coli</i>	25	9.7
<i>Salmonella spp</i>	02	0.7
<i>Enterococcus spp</i>	05	2.0
<i>Enterobacter spp</i>	01	0.4

coccus aureus and *Proteus mirabilis* with the least being enterobacter spp 1.

In Figure 1 above, isolates were more resistant to ampicillin 23.4%, Ciprofloxacin 23.3%, Tetracycline 17.2% and Erythromycin 17.2%. Antibiotics to which there were less resistance included Cefotaxime 1.8% (0-1.5%), and Gentamicin 6.3% (5-25%) while intermediate resistance was seen with chloramphenicol 15.6%.

While most of the resistances were relatively stable in the 5 years considered resistance to ciprofloxacin was constantly growing.

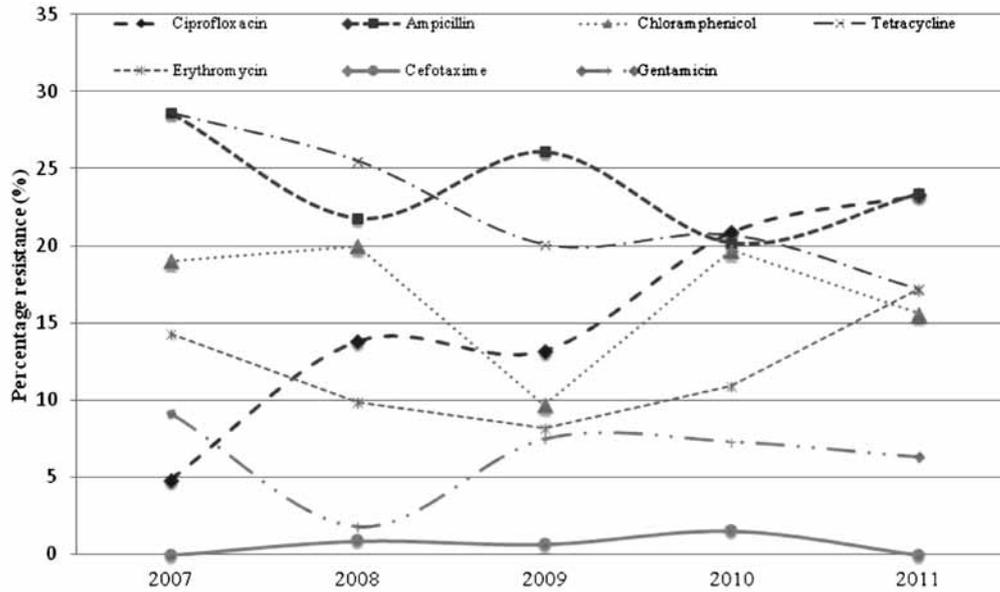
Discussion

Gonorrhoea is one of the most common sexually transmitted infections (STIs) in developing countries, and the emergence of resistance to antimicrobial agents in *Neisseria gonorrhoeae* is a major obstacle in the control of gonorrhoea. Periodical monitoring of antimicrobial susceptibility of *N. gonorrhoeae* is essential for the early detection of emergence of drug resistance.

The control of gonococcal infection is important considering the high incidence of acute infections, complications, and sequelae and its role in facilitating acquisition and transmission of HIV [7]. The knowledge of antimicrobial susceptibility of *N. gonorrhoeae* is a prerequisite for the proper treatment and control of gonococcal infection. A regional programme for monitoring gonococcal antimicrobial susceptibility has been established in developed countries, such as the USA, Canada, Australia, and the Netherlands. However, in developing countries where the burden of disease is high and the resistances the greatest, such activity rarely exists.

A high prevalence of plasmid mediated high-level or chromosomally mediated low-level resistance to penicillin or tetracycline has been reported in southeast Asia [8] and in African countries [9].

The currently recommended main treatments for gonorrhoea are ceftriaxone, and ciprofloxacin. None of these agents are inexpensive. To ensure that limited resources are used in

Fig. 1. Showing trend of isolates resistance to antibiotics used in Lacor Hospital, Gulu between 2007 and 2011.

the best possible way, continuous surveillance of gonococcal resistance to these drugs is critically important.

The results of this study demonstrated that of the 640 consecutive patients considered, 151 (59%) were found to be having gonococcal urethritis. Gonococcal urethritis was found more in males' patients and less in the females, this is because females are mainly asymptomatic carriers and takes longer period of time for the signs and symptoms to show up.

Further, on the antibiotic sensitivity pattern, the study also demonstrated that there was significantly reduced sensitivity to ampicillin 23.4%, Ciprofloxacin 23.3%, Tetracycline 17.2% and Erythromycin 17.2%.

Antibiotics to which there were less resistance included Cefotaxime 1.8% (0-2.5%), and Gentamicin 6.3% (5-25%) while intermediate resistance was seen with chloramphenicol 15.6%. This finding is consistent with a study by Monir *et al.* (2010) where they discovered that isolates were more resistant to penicillins, fluoroquinolones and tetracycline but all the isolates were sensitive to cephalosporin and macrolides.

The reasons for this outbreak of *Neisseria gonorrhoeae* strains with reduced sensitivity to Tetracycline, Ampicillin and Ciprofloxacin could be due to increasing misuse of the antibiotics (drugs over the counter) as the empirical first-line treatment for *Neisseria gonorrhoeae* for the last several years, and also re-infection due to the presence of a large reservoir of asymptomatic carriers that unknowingly transmit the disease to their sexual contacts since most women are not by their spouses when they are on treatment.

Because of the high prevalence of *Neisseria gonorrhoeae* isolates with low susceptibility to tetracycline, ampicillin, erythromycin and ciprofloxacin, it seems that single-dose treatment with these agents may be problematic as first-line therapy for gonorrhoea in this district /country.

Therefore, the antimicrobial sensitivity of *Neisseria gonorrhoeae* to Cefotaxime, gentamicin and the therapeutic efficacy of these antibiotics should be closely monitored. Although the isolates were resistant to Tetracycline, Ampicillin, Erythromycin, and Ciprofloxacin and intermediate to Chloramphenicol they were also sensitive to a panel of antibiotics such as Gentamicin (93.7%) and Cefotaxime (98.2%), therefore this can still assist in single dose management of *N. gonorrhoeae*.

Conclusion

Gonorrhoea is one of the old but re-emerging diseases in developing countries.

The prevalence of *Neisseria gonorrhoeae* in patient attending St. Mary's Hospital Lacor-Gulu general out-patient was at 59%, and all of these had symptoms of pus discharges and frequency suggesting gonococcal urethritis.

The most common pathogen isolated was *Neisseria gonorrhoeae* (59%), followed by *Klebsiella pneumoniae*, *Streptococcus*, *Escherichia coli* (9.7%) respectively, *Staphylococcus aureus* and *Proteus mirabilis* with the least being enterobacter spp (0.4%).

The *N. gonorrhoeae* isolates were sensitive to Cefotaxime (98.2%) and Gentamicin (93.7%) and were intermediate to Chloramphenicol (15.2%), but these same isolates were also resistant to a panel of antibiotics like Ampicillin (23.4), Ciprofloxacin (23.3%), Erythromycin (17.2%) and Tetracycline (17.2%). This therefore calls for sensitization on drug use.

The high rate of resistance to panel of antibiotics like Ampicillin, ciprofloxacin, Tetracycline and erythromycin may preclude the use of these antibiotics as the empiric treatment of *Neisseria gonorrhoeae* in the region of north Uganda.

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■ Correspondence: Peace Amito Florence, Department of Microbiology, St. Mary's Hospital Lacor, P.O. Box 180, Gulu, Uganda. Tel. +256 782381045/ +256 715437803 - Fax +256 471 432665 - E-mail: peace.amito@gmail.com or peace_amito@yahoo.com