International Journal of Biomedical and Health Sciences
Vol. 3, No. 1, March 31, 2007
Printed in Nigeria

0794-4748/2007 $12.00 + 0.00

http://www.asopah.org

IJBHS 2006028/3101

Sensitivity pattern of *Pseudomonas aeruginosa* at Aminu Kano Teaching Hospital, Kano, Nigeria

S. K. Abdulhadi*[1], A. H. Kawo[2] and A. H. Arzai[2]

[1]Pathology Department, Murtala Mohammed Specialist Hospital, P.M.B. 3200, Kano, Nigeria
[2]Microbiology Unit, Department of Biological Sciences, Bayero University, P.M.B. 3011, Kano

(Received August 16, 2006)

ABSTRACT: A study was carried out to determine the antimicrobial sensitivity pattern of isolates of *Pseudomonas aeruginosa* obtained from different clinical specimens at Aminu Kano Teaching Hospital, Kano, Nigeria. Five hundred and twenty (52) isolates were investigated using disc diffusion method. One hundred percent (100%) sensitivity to Ofloxacin, ceftazedine and ciprofloxacin was recorded. One hundred percent (100%) resistant to tetracycline, ampicillin and co-trimoxazole, while 98.1%, 95.2%, 85.6%, 51.9%, 34.6% and 3.8% resistance to chloramphenicol, nalidixic acid, gentamycin, streptomycin, augmentin and peflocine were recorded respectively. There was no significant difference in the antimicrobial sensitivity pattern of *P. aeruginosa* isolates from the different clinical specimens (P >0.05). The implication of the findings is that *P. aeruginosa* could be effectively treated with ofloxacin, ceftazidime, ciprofloxacin and peflocine and not with tetracycline, ampicillin and co-trimoxazole in kano.

Keywords: Antibiotics, *Pseudomonas aeruginosa, in-vitro* sensitivity testing, Kano.

Introduction

Within the past thirty years, there has been an upsurge in the global emergence of antibiotic resistance in many of the common bacterial pathogens (Jawetz *et al.,* 2000; Njoku – Obi *et al.,* 1988), which are known to cause serious infections and sepsis all over the world including Nigeria (Njoku – Obi *et al.,* 1988).

Pseudomonas aeruginosa is an ubiquitous organism with a world – wide distribution (Gilard, 1985; Jawetz *et al.,* 2000). It is implicated in a variety of infections particularly in the immunocompromised host. It is frequently associated with nosocomial infections of burns, wounds and urinary tract when introduced by cathethers, instruments or rinsing solutions. It can also cause respiratory and endotracheal tubes (Gilard, 1985; Heirholzer and Zervos, 1991). The organism is known to acquire resistance to many antibiotics and infections due to it often requires synergistic antimicrobial combination (Mosher and Vinning, 1992).

To effectively treat and control infections, a good knowledge of antibiotic sensitivity pattern of the causative agents is therefore of an ultimate importance. The present study was undertaken to report on the antimicrobial sensitivity pattern of the strains *Pseudomonas aeruginosa* isolated from diverse clinical materials at the Aminu Kano Teaching Hospital, Kano, Nigeria.

To whom correspondence should be addressed. E-mail: mhskumurya@yahoo.com

Materials and Methods

Collection of Specimens

Five hundred and twenty (520) isolates of *Pseudomonas aeruginosa* were isolated from diverse clinical specimens at AKTH. A total of nine hundred (900) specimens were obtained comprising of wound (260), ear (210), throat (200), mid – stream urine sample (150) and sputum samples (80). Sterile bacteriological standard swab sticks were used to collect the swab samples as described by Cheesbrough (2000) while sterile universal containers were used in collecting clean – catch mid – stream urine samples as described by Kunin (1979).

Bacteriological Analysis of the Samples

The samples were streaked (within 30 minutes of collection) on Blood agar (0xoid) and McConkey agar (Oxoid) plates and incubated aerobically at 37^{o}C for 24 hours. After 24 hours of incubation, the culture plates were examined. Suspected colonies of *P. aeruginosa* showing typical characteristics were identified using standard methods (Cowan, 1993). Biochemical tests were carried out to confirm the identity of the organisms isolated (Cheesbrough, 2000).

Antimicrobial sensitivity was carried out by disc diffusion technique (Chris and Fisher, 2005) using Meuller – Hinton agar plates. Boston *P. aeruginosa* (ATCC No. 27853) was used as control on the sensitivity tests. Zones of inhibition of $\geq$ 17mm were considered sensitive, 14 – 16 mm intermediate and $\leq$ 13 mm resistant.

Statistical Analysis

Comparison between sensitive strains and the resistant strains of *P. aeruginosa* from the different clinical specimens was carried out using X^2 and Wilcon rank sum tests (Harry and Steven, 1994).

Results

Of the nine hundred (900) samples analysed in the study, 520 yielded *P. aeruginosa* isolates (Table 1). The results of the antimicrobial sensitivity tests of the isolates of *P. aeruginosa* are given in Table 2. As can be seen that all the tested isolates (100%) were susceptible to ofloxacin, ceptazidime and ciprofloxacin, while they were all resiatant to ampicilin, co-trimoxazole and tetracycline. Few of the isolates were susceptible to chloramphenicol (1.9%), nalidixic acid (5.8%), gentamycin (14.4%) and streptomycin (48.1%) while majority were sensitive to peflacine (96.2%) and augmentin (65.4%). There was no significant difference ($P < 0.05$) in the antimicrobial sensitivity pattern of *P. aeruginosa* isolates from the different clinical specimens at AKTH.

Table 1: Prevalence of *Pseudomonas aeruginosa* isolates from clinical specimens at AKTH

Type of specimen	**Number of samples**	**Number producing isolates (%)**
Mid – stream urine	150	70 (46.7)
Wound swabs	260	150 (57.7)
Ear swabs	210	140 (66.7)
Throat Swabs	200	120 (60.0)
Sputum	80	40 (50.0)
Total	**900**	**520 (57.8)**

Table 2: *In-vitro* antimicrobial susceptibility pattern of the *Pseudomonas aeruginosa* isolates from clinical specimens at AKTH

Antibiotics (Concentration)	**No. of sensitive isolates (%)**	**No. of resistant isolates**
Oflozaxin (10µg)	520 (100)	0 (0.0)
Ceftazidime (10µg)	520 (100)	0 (0.0)
Ciprofloxacin (10µg)	520 (100)	0 (0.0)
Peflacine (10µg)	500 (96.2)	20 (3.8)
Augmentin (10µg)	340 (65.4)	180 (34.6)
Streptomycin (10µg)	250 (48.1)	270 (51.9)
Gentamicin (10µg)	75 (14.4)	445 (85.6)
Nalidixic acid (10µg)	25 (5.8)	495 (95.2)
Chloramphenicol (10µg)	10 (1.9)	510 (98.1)
Co-trimoxazole (10µg)	0 (0.0)	520 (100)
Ampicillin (10µg)	0 (0.0)	520 (100)
Tetracycline (10µg)	0 (0.0)	520 (100)

Discussion

Various studies have been carried out by many researchers in different parts of the world establishing sensitivity pattern of *Pseudomonas aeruginosa.* The prevalence of resistance amongst isolates in the present study is high. One hundred percent (100%) resistance to co-trimoxazole, ampicillin, tetracycline and 98.1%, 95.2%, 85.6% and 51.9% resistance to chloramphenicol, nalidixic acid, gentamicin and streptomycin respectively were recorded. These findings collaborate that of other workers. Aseffa and Yohannes (1996) recorded a 95.3%, 95.0%, 90.0% and 5.0% resistance to ampicillin, co-trimoxazole, chloramphenicol, tetracycline and gentamicin respectively by *pseudomonas species* in their study. Ademoyo *et al*., (1994) recorded a 100% resistance to cotrimoxazole, ampicillin and nalidixic acid and a 71.0% resistance to gentamicin by *pseudomonas* species in their study. Shawar *et al.,* (1999) recorded a 30% resistance to gentamicin by *P. aeruginosa* isolates obtained from patients with cystic fibrosis. However, pattern of resistance may differ in different hospitals depending on a number of factors, which include antibiotic prescription pattern, patients involved, the level of hygiene and infection control (Latham and Shaftner, 1992; Mosher and Vining, 1992). The variation found in the resistance pattern to these commonly used drugs could be attributed to the prevailing usage and abuse of the drugs in the areas under study.

The high rate of resistance to the commonly used drugs in this study contrasts with the high (100%) sensitivity to ofloxacin, ciprofloxacin and ceftazidime which are less frequently used. This further suggests a relationship between antibiotic usage and the level of drug resistance. The implication of the findings is that *P. aeruginosa* could be effectively treated with ofloxacin, ciprofloxacin and ceftazidime and not with tetracycline, ampicillin, co-trimoxazole and chloramphenicol in Kano.

Conclusion and Recommendations

The judicious use of antimicrobials by health workers and efforts to control their procurement and use in the locality will help to limit the increasing rate of drug resistance in pathogens. It is the recommendation of this study that constant evaluation of antimicrobials sensitivity patterns of pathogens for commonly used antimicrobial agents in the particular environment be carried out.

ACKNOWLEDGEMENT: The authors are very grateful to the laboratory staff of AKTH for their assistance during the course of the study.

References

Adeyemo, A. A., Gbadegesin, R.A., Onyemenen, T. and Ekweozor, C.C. (1994): Urinary tract pathogens and antimicrobial sensitivity patterns in children in Ibadan, Nigeria. *Annals of Tropical Paediatrics,* 14:271 – 274.

Aseffa, A. and Yohannes, G. (1996): Antibiotics Sensitivity pattern of prevalent bacterial pathogens in Gondar, Ethiopia. *East African Medical Journal.* 73(1): 67 – 71.

Cheesbrough, M. (2000): *District Laboratory Practice in Tropical Countries* 2. Cambridge University Press. Pp. 180 – 242.

Chris, F. H. and Fisher, M. (2005): The Urological Management of the Patients with Acquired Immunodeficiency Syndrome. *BJU International* 95(5): 709 – 711.

Cowan, S. T. (1993); *Cowan and Steel's manual for the identification of medical bacteria.* Cambridge University Press, London.

Gilard, G.L. (1985): Pseudomonades. In: *Manual of Clinical Microbiology.* Lenet, E.H.; Balows, A., Hausler, W.J. and Shadowy, H.J. (eds). *American Society for Microbiology*, Washington. Pp. 350 – 372.

Harry, F. and Steven, C.A. (1994): *Statistics: Concepts and Applications.* 2. Cambridge University Press. Pp. 98 – 121.

Hiersholzer, W.J. and Zervos, M.J. (1991): Nosocomial bacterial infections. In: *bacterial Infections of Humans.* A. S. Evans and P. S. Brachman (eds). 2nd ed. Plenum Medical Book Company, New York. Pp. 467 – 497.

Jawetz, E., Melnick, T. and Adelberg, S. (2000): *Medical Microbiology.* 21st Edition. Mc Graw Hill Medical Publishers. Pp. 112 – 215.

Kunin, C.M. (1979): *Detection, Prevention and Management of Urinary Tract Infections.* Third Edition. Henry Kimpton Publishers, London. Pp. 7 – 9.

Latham, R. and Shaftner, W. (1992): Hospital Epidemiology In: *Encylopedia of Microbiology.* Vol. 2. J. Lederberg (Chief ed). Academic Press, London. P. 471.

Mosher, R.H. and Vining, L.C. (1992): Antimicrobial Resistance In: *Encylopedia of Microbiology.* Vol. 1. J. Lederberg (Chief ed). Academic Press, London. Pp. 77 - 106.

Shawar, R.M., Macleod, D.L., Garber, R.L., Buras, J.L., Stapp, J.R., Clausen, C.R. and Tanaka, S.K. (1999): Activities of Tobramycin and six isolates from patients with cystic fibrosis. *Antimicrobial agent and chemotherapy*, 43(12): 2877 – 2880.