

## ORIGINAL ARTICLE

AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY JAN 2015 ISBN 1595-689X VOL16 No.1  
AJCEM/1504  
AFR. J. CLN. EXPER. MICROBIOL. 16(1): 33-36 <http://dx.doi.org/10.4314/ajcem.v16i1.6>  
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### **PSEUDOMONAS AERUGINOSA INFECTIONS IN A TERTIARY HOSPITAL IN NIGERIA.**

\*Iregbu KC, Eze SO,

Department of Medical Microbiology and Parasitology, National Hospital, Abuja, Nigeria

\*Correspondence: Department of Medical Microbiology and Parasitology, National Hospital, Abuja, P.M.B. 425, Garki, Abuja, Nigeria. Email ; keniregbu@yahoo.co.uk

#### ABSTRACT

**Background:** *Pseudomonas aeruginosa* is a known opportunistic pathogen frequently causing serious infections. It exhibits innate resistance to a wide range of antibiotics thus causing high rates of morbidity and mortality worldwide.  
**Objective:** This study was done to determine the distribution and the antibiotic susceptibility pattern in clinical isolates of *Pseudomonas aeruginosa* in NHA.  
**Method:** Laboratory data on 265 *Pseudomonas aeruginosa* isolates from a total of 30,384 clinical specimens processed over a 3 year period (January 1st 2010 to December 31st 2012) were analyzed.  
**Results:** A total 30,384 samples were submitted for bacteriologic analysis, 265 (1%) yielded *Pseudomonas aeruginosa* of which 195 (74%) were from in-patient and 70 (26%) from out-patients. 185 (70%) isolates were from adults while 80 (30%) were from children. 87% of the isolates were susceptible to imipenem, 77% to amikacin, while 34% were resistant to ciprofloxacin and 46% resistant to ceftazidime.  
**Conclusion:** The relatively high proportion of resistance to ciprofloxacin and ceftazidime, and the emerging resistance to amikacin and imipenem are worrisome and calls for rational antibiotic use and institution of effective resistance surveillance and infection control measures. .

**Keywords:** *Pseudomonas aeruginosa*, National Hospital Abuja, Susceptibility

### **INFECTIONS A PSEUDOMONAS AERUGINOSA DANS UN HOPITAL TERTIAIRE AU NIGERIA.**

\*Iregbu KC, Eze SO,

Département de Microbiologie Médicale and Parasitologie, Hôpital National, Abuja, Nigéria

\*Auteur Correspondant: Département de Microbiologie Médicale and Parasitologie, Hôpital National, Abuja, P.M.B. 425, Garki, Abuja, Nigéria. E-mail ; keniregbu@yahoo.co.uk

#### RESUME

**Contexte:** *Pseudomonas aeruginosa* est un germe pathogène opportuniste reconnu causant fréquemment des sévères infections. Il présente à la résistance innée à une large gamme d'antibiotiques provoquant de taux élevés de morbidité et de mortalité dans le monde.  
**Objectif:** Cette étude a été réalisée pour déterminer la répartition et la sensibilité d'antibiotiques de souches cliniques de *Pseudomonas aeruginosa* à l'hôpital National d'Abuja.  
**Méthodes:** Les données de laboratoire de 265 souches de *Pseudomonas aeruginosae* isolées à partir de 30 384 d'échantillons cliniques traités sur une période de 3 ans (1<sup>er</sup> Janvier 2010 au 31 Décembre 2012) ont été analysées.  
**Résultats:** Au total, 30 384 échantillons ont été soumis pour l'analyse bactériologique: *Pseudomonas aeruginosa* ont été obtenus dans 265 (1%) échantillons dont 195 (74%) étaient des patients hospitalisés et 70 (26%) patients externes. 185 (70%) souches ont été isolées chez les adultes alors que 80 (30%) étaient chez les enfants. 87% de souches étaient sensibles à l'imipénème, 77% à l'amikacine, pendant que 34% étaient résistantes à la ciprofloxacine et 46% à la ceftazidime.  
**Conclusion:** La proportion relativement élevée de la résistance à la ciprofloxacine et à la ceftazidime, et l'émergence d'une résistance à l'amikacine et à l'imipénème est inquiétante, et les appels à usage rationnel de l'antibiotique et une institution de surveillance efficace de la résistance et les mesures du contrôle de l'infection.

**Mots clés:** *Pseudomonas aeruginosa*, Hôpital National d'Abuja, Sensibilité

## INTRODUCTION

*Pseudomonas aeruginosa* is a Gram-negative aerobic rod that causes severe nosocomial infections, associated with increased mortality (1,2). It has a predilection for moist environments and can be found in water and soil and on plants, including fruits, vegetables, and flowers (3).

The organism is rarely found as part of the microbial flora of healthy people, but may occasionally colonize healthy individuals; the sites of colonization include the gastrointestinal tract and moist body sites, such as the throat, nasal mucosa, axillary skin and perineum (3). Aqueous solutions used in medical care such as disinfectants, soaps, irrigation fluids, eye drops, and dialysis fluids may all become contaminated with *P. aeruginosa* (4).

Nosocomial infections caused by *P. aeruginosa* have been recognized as an acute problem in hospitals due to its intrinsic resistance to many classes of antibiotics and its ability to acquire resistance to all effective antibiotics (5). These infections among others include surgical site infections, urinary tract infections, pneumonia, and bloodstream infections (BSI) (6).

Effective management of *P. aeruginosa* infections requires good background knowledge of the prevailing antimicrobial susceptibility patterns of the organism. There is paucity of data on *Pseudomonas aeruginosa* infections in Abuja. This study was therefore, carried out to determine the distribution and the antibiotic susceptibility pattern of *Pseudomonas aeruginosa* in clinical isolates at the National Hospital Abuja, to serve as a guide for doctors managing patients with *Pseudomonas aeruginosa* infections.

## METHOD

The data studied were from the archival records of the department of medical microbiology of National Hospital Abuja, a 200-bedded referral tertiary hospital located in the heart of the Federal Capital Territory of Nigeria, over a three-year period stretching from 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2012.

Records of *Pseudomonas aeruginosa* isolates were analyzed for gender, age, ward, sample type and antibiotic susceptibility using Microsoft excel 2007 software. Isolates with no age, gender, ward and antibiotic susceptibility were excluded (N= 42).

All samples were processed and identifications carried out using established procedures<sup>7</sup>.

## RESULTS

A total 30,384 samples were submitted for bacteriologic analysis, 265(1%) yielded

*Pseudomonas aeruginosa*. Of these 185 (70%) were from adults, while 80 (30%) were from children. 140 (53%) were males while 125 (47%) were females (Table 1).

**TABLE 1: AGE AND GENDER DISTRIBUTION OF PATIENTS WITH PSEUDOMONAS AERUGINOSA ISOLATES**

AGE	n	%
Neonate (<28days)	16	6.0
Infants (>29days -1yr)	29	11.0
Children(>1 -15yrs)	35	13.2
Adult (>15 - 64yrs)	167	63.0
Elderly (>65yrs)	18	6.8
<b>TOTAL</b>	<b>265</b>	<b>100</b>
<b>GENDER</b>	<b>N</b>	<b>%</b>
<b>Male</b>	<b>140</b>	<b>52.8</b>
<b>Female</b>	<b>125</b>	<b>47.2</b>
<b>Total</b>	<b>265</b>	<b>100</b>

195(74%) isolates were from in-patients and 70(26%) from out-patients. Surgery & paediatrics had higher isolates from the inpatient wards, 61(31%) and 49(25%) respectively, while the intensive care unit (ICU) and the accident and emergency (A&E) unit specimens respectively yielded 9(5%) and 26(14%) of the isolates (Table 2).

*Pseudomonas aeruginosa* was sensitive to imipenem 87%(176/203), amikacin 77%(142/185), but resistant to ciprofloxacin 34%(59/175), gentamicin 44%(70/160), ofloxacin 45%(29/64) and ceftazidime 46%(85/191). (Table 3). Resistance in ICU appears higher than in other locations (Table 4).

TABLE 2; PSEUDOMONAS AERUGINOSA ISOLATES IN SELECTED LOCATIONS

Wards	No.	%
Out-Patients	70	26
<b>In-Patients</b>		
Medical	37	20
Surgical	61	32
Gynaecology	13	7
ICU	9	5
A &E	26	14
Paediatrics	49	25
<b>Total In-patients</b>	<b>195</b>	<b>74</b>
<b>Grand Total</b>	<b>265</b>	<b>100</b>

TABLE 3: SENSITIVITY PATTERN OF PSEUDOMONAS AERUGINOSA

Antibiotics	No tested	% Sensitivity
Imipenem	176 (203)	87
Amikacin	142 (185)	77
Ciprofloxacin	116 (175)	66
Gentamicin	90 (160)	56
Ofloxacin	35 (64)	55
Ceftazidime	106(191)	56

TABLE 4. PERCENTAGE SENSITIVITY OF PSEUDOMONAS ISOLATES BY LOCATION

Wards	Surgical	Medical	ICU	Paediatric	A& E	Gynae	Outpatient
<b>Antibiotics</b>							
Imipenem	93 (42/45)	90 (18/20)	83 (5/6)	88 (28/32)	80 (12/15)	71(5/7)	89(41/46)
Amikacin	82 (37/45)	77 (17/22)	66.7 (2/3)	81 (17/21)	71 (10/14)	71 (5/7)	78(28/36)
Ciprofloxacin	69 (29/42)	26 (5/19)	43 (3/7)	88 (21/24)	79 (11/14)	83 (5/6)	63(22/35)
Gentamicin	63 (27/43)	50 (10/20)	50 (1/2)	69 (16/23)	46 (6/13)	100 (4/4)	55 (16/29)
Ofloxacin	42 (5/12)	100 (3/3)	100 (1/1)	83(10/12)	57 (4/7)	43 (3/7)	38 (5/13)
Ceftazidime	72 (28/39)	24(5/21)	25 (1/4)	54 (19/35)	47 (7/15)	60 (3/5)	67 (28/42)

**DISCUSSION**

This study revealed that Pseudomonas aeruginosa infections were more common in adults than in children, but higher in children fifteen years and below than in the elderly; there is a slight male preponderance. These results agree with those of

similar studies carried out in Enugu, Nigeria and India (8,9).Surgery ward had the highest number of isolates. This may be because surgical patients stay relatively long in the hospital, have a breach of their protective skin and the fact that many patients going in for major surgery tend to get catheterised.

The high resistance profile of the isolates to ciprofloxacin and ceftazidime most probably reflects the extensive and inappropriate use of these antibiotics as revealed in previous studies (9,10). The resistance to ceftazidime is particularly worrisome as this is the only third generation

cephalosporin to which Pseudomonas aeruginosa is naturally sensitive. The relatively and moderate sensitivity to imipenem and amikacin again mirrors the not too frequent use of these drugs in our facility. With increasing resistance to ceftazidime and ciprofloxacin there is tendency that more selective pressure will bear on these drugs as therapeutic alternatives, with rising resistance. The pattern of antibiotic sensitivity may vary in different hospitals, and in different sections of the same hospital depending on such factors such as antibiotic prescribing policy, types of patients, level of hygiene and infections control practices.

The sensitivity pattern seen in this study shows that inappropriate antibiotic treatment for Pseudomonas aeruginosa infections, and indeed other infections, may lead to increased morbidity and mortality in the hospital. There is therefore, need to maintain regular antibiotic surveillance and to adhere to rational antibiotic prescribing guidelines.

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