

# A 14-Year Antibigram Pattern of Isolated Organisms from Pressure Ulcers in Stroke Patients

**\*Odiase FE, \*\*Lofor PV**

*\*Department of Medicine, College of Medical Sciences, University of Benin, Benin City, Nigeria*

*\*\*Department of Medical Microbiology, College of Medical Sciences, University of Benin, Benin City, Nigeria*

## Correspondence

*Dr. Francis E. Odiase  
Department of Medicine  
College of Medical Sciences  
University of Benin.  
Benin City, Nigeria.  
E-mail: francisodiase2000@hotmail.com*

**Citation:** Odiase FE, Lofor PV (2020). A 14-year antibiogram pattern of isolated organisms from pressure ulcers in stroke patients. *Nig J Med Dent Educ*; 2(1):c35-c40.

## INTRODUCTION

Stroke is often complicated by pressure ulcers that are infected by microorganisms. The indiscriminate use of antibiotics, oral or parenteral for proper or improper uses has led to the emergence and spread of resistant micro-organism. Resistance of isolated microorganism to antibiotics is currently a major medical and public health problem. There is paucity of information on the antibiogram of isolated micro-organism from pressure ulcer of stroke patient in Nigeria. We aimed to study the antibiotic resistance pattern of isolated organism from the pressure ulcer of stroke patients.

## MATERIALS AND METHODS

This was a retrospective record review involving 679 clinical isolates from pressure ulcers of stroke patient admitted into the medical and stroke ward at University of Benin Teaching Hospital Benin City from June 2004 to June 2018.

Data extracted included demographics, stroke types, microbial isolates, and antibiogram. Antimicrobial susceptibility screening was performed using fifteen commonly used antibiotics, by the Kirby Bauer disk diffusion technique. Statistical analysis was done using the proportion of sensitive, intermediate and resistant isolates.

Antimicrobial susceptibility screening was performed using fifteen antimicrobials including, Co-

amoxiclav, gentamicin, Ceftriaxone, Chloramphenicol, Ceftazidime Others are Ciprofloxacin, Cefuroxime, Tetracycline, Levofloxacin, Imipenem, meropenem, vancomycin, ampicillin, etapenem, nystatin. The zone size around each antimicrobial disk was interpreted as sensitive, intermediate or resistant according to the CLSI criteria.

## RESULTS

The mean age of the patients was 64.2(10.8) years, with the age range from 37 to 97 years. Seventy-eight percent had ischemic stroke while 22% had hemorrhagic stroke. About fifty-four percent (363) of the sampled ulcers were from female participants. The most common pathogens isolated were *Proteus mirabili* (33%), *Enterococcus species* (24.2%) and *Staphylococci species* (12%). All 679 isolates were multidrug resistant. The mean microbial resistance to antibiotics during the period under review was 33.9%. In the first seven years the microbial resistance to antibiotics ranged from 25.2% to 31.1%, while the last seven years the resistance range was 34.2% to 43.9%. A high level of resistance was observed for ciprofloxacin (62%), co-amoxiclav (48.8%) and ceftriaxone (22%) while emerging resistance for imipenem (17.5%) and meropenem (20.7%) was also observed. The isolates showed the highest sensitivities for gentamicin (64.5%) and levofloxacin (77.7%).

Table 1: The isolated micro-organism per year based on gender

Year	Male N	Female N	Total N
2004	10	9	19
2005	21	20	41
2006	13	23	36
2007	14	34	48
2008	17	22	39
2009	23	25	48
2010	28	21	49
2011	19	22	41
2012	18	20	38
2013	22	30	52
2014	31	20	51
2015	20	41	61
2016	29	35	64
2017	31	22	53
2018	20	19	39

Table 2: Frequency and percentage resistance to the tested antibiotics

Antibiotics	Total Isolates N	Sensitivity n (%)	Resistance n (%)
AMC	682	134 (19.6)	335 (48.8)
CN	684	442 (64.5)	56 (8.2)
CRO	679	330 (48.6)	146 (22.0)
CIP	615	108 (17.6)	379 (62.0)
LEV	582	452 (77.7)	54 (9.3)
IPM	446	298 (66.8)	78 (17.5)
MER	217	135 (61.8)	45 (20.7)

AMC = Co-amoxiclav, CN = Gentamicin, CRO = Ceftriaxone, CIP = Ciprofloxacin, LEV = Levofloxacin, IPM = Imipenem, MER= Meropenem

Table 3a: Sensitivity and Resistance Frequency of Antibiotics Per Year in 679 Isolates

	AMC			CN			CRO			C			CAZ		
	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R
2004	11	7	1	9	3	2	12	5	2	1	10	6	7	8	4
2005	18	21	2	38	1	2	31	6	4	9	7	21	25	11	5
2006	11	20	5	30	4	2	19	12	5	-	-	-	14	13	9
2007	8	21	19	41	5	2	33	8	7	-	-	-	13	11	5
2008	9	17	13	34	9	6	23	7	9	-	-	-	8	26	5
2009	11	17	20	39	6	3	34	10	4	-	-	-	4	37	7
2010	8	13	31	35	7	7	28	11	10	-	-	-	6	34	9
2011	7	5	29	29	8	4	31	6	5	-	-	-	4	26	11
2012	3	7	28	27	9	2	29	3	6	-	-	-	7	7	24
2013	2	18	32	27	19	6	26	18	8	-	-	-	3	12	37
2014	4	16	31	26	23	2	17	6	28	-	-	-	7	37	7
2015	7	26	28	29	30	2	15	29	17	-	-	-	9	47	8
2016	14	12	38	28	27	9	12	45	8	-	-	-	5	8	51
2017	8	7	38	30	21	2	9	31	13	-	-	-	7	14	32
2018	13	9	17	19	15	5	11	6	20	-	-	-	2	10	27

**Key:** S = Sensitivity, R = Resistance, I = Intermediate resistance, AMC = Co-amoxiclav, CN = gentamicin, CRO = Ceftriaxone, C = Chloramphenicol, CAZ = Ceftazidime

Table 3b: Sensitivity and Resistance Frequency of Antibiotics Per Year Amongst 679 Isolates

	CIP			CXM			TE			LEV			IPM		
	S	I	R	S	I	R	S	I	R	S	I	R	S	I	R
2004	2	-	6	6	3	5	-	1	13	-	-	-	-	-	-
2005	19	13	9	17	12	7	-	-	25	-	-	-	-	-	-
2006	11	15	10	13	9	14	-	3	15	-	-	-	-	-	-
2007	6	12	30	21	11	16	-	-	-	38	9	1	-	-	-
2008	4	8	27	10	8	21	-	-	-	31	5	3	-	-	-
2009	9	11	28	11	7	30	-	-	-	37	8	3	-	-	-
2010	14	9	26	14	9	26	-	-	-	36	9	4	41	7	1
2011	9	3	29	13	7	21	-	-	-	35	4	2	37	3	1
2012	5	11	22	11	8	19	-	-	-	33	3	2	36	1	1
2013	4	10	38	10	20	22	-	-	-	47	2	3	48	3	1
2014	6	8	37	7	15	24	-	-	-	43	5	3	49	3	1
2015	4	12	41	8	-	-	-	-	-	46	9	6	41	10	10
2016	8	11	36	13	17	34	-	-	-	39	15	10	21	30	13
2017	7	6	40	13	10	9	-	-	-	40	2	11	16	4	31
2018	-	-	-	15	-	8	-	-	-	27	5	6	9	10	20

**Key:** I = Sensitivity, R = Resistance, I = Intermediate resistance, CIP = Ciprofloxacin, CXM = Cefuroxime, TE = Tetracycline, LEV = Levofloxacin, IMP = Imipenem

Table 4: A 14 - Year Antibiotics Percentage Resistance Pattern Per Year

Year	Total Isolates	Resistance (%)
2004	126	39 (30%)
2005	298	75 (25.2%)
2006	234	60 (25.6%)
2007	317	80 (25.2%)
2008	283	84 (29.3%)
2009	336	95 (28.3%)
2010	395	114 (28.9%)
2011	328	102 (31.1%)
2012	304	104 (34.2%)
2013	416	147 (35.3%)
2014	403	132 (32.8%)
2015	474	112 (23.6%)
2016	503	199 (39.6%)
2017	401	176 (43.9%)
2018	249	103 (41.4%)

Table 5: Isolated organisms from the pressure ulcers of the 679 stroke patients

Isolated organisms	Male (%)	Female (%)	Total (%)
<i>Proteus mirabilis</i>	14	19	33
<i>Enterococci species</i>	7	17	24
<i>Staphylococci species</i>	5.8	5.4	11.2
<i>Citrobacter freundii</i>	2.8	6.8	9.0
<i>Enterobacter aerogenes</i>	3.8	3.2	7.0
<i>Escherichia coli</i>	1.2	4.9	6.1
<i>Klebsiella pneumonia</i>	2.3	2.4	4.7
<i>Klebsiella oxytoca</i>	0.7	0.4	1.1
<i>Candida albicans</i>	0.7	0.9	1.6
Mixed bacteria growth	1.1	1.2	2.3

## DISCUSSION

Antimicrobial resistance is a major medical and public health problem. Gram positive and Gram-negative bacteria continuously develop resistance to antibiotics that are in regular use at different time periods. The main reason for development and spread of bacterial resistance is injudicious use of antimicrobial agents. Ciprofloxacin had the highest microbial resistance with similar findings in other studies. Co-amoxiclav is the next highest with microbial resistance from this work and it has similarly been observed in other studies. The efficacy of a new drug may change as it is used in clinical settings. And resistant bacterial clones result from the encounter of drug and organism. Newly introduced antimicrobial agents imipenem and meropenem with the levels of resistance observed are frightening with similar patterns observed elsewhere. Gentamicin and levofloxacin had the least resistance and this is explained by the very limited use of gentamicin and levofloxacin in clinical practice

## CONCLUSION

Local studies meant to understand the isolated organisms and resistance pattern, may guide the clinician on the choice of appropriate empirical therapy.

It is hoped that rational use of antimicrobial agents and constant surveillance for emerging microbial resistance would help control the spread of bacterial resistance

## Financial support and sponsorship

This work received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

## Conflict of interest

The authors declare that they have no conflicts of interest.

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