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### METHICILLIN RESISTANT *S. AUREUS* (MRSA) AND THEIR ANTIBIOTIC SENSITIVITY PATTERN IN KANO, NIGERIA

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#### Abstract

**Background:** Nosocomial infection caused by methicillin resistant *S. aureus* (MRSA) presents with management difficulties in infected patients due to their resistance to a number of other frontline antibiotics and constitutes significant epidemiological problems. This study was undertaken to determine the prevalence of methicillin resistant *S. aureus* and antibiotic sensitivity pattern in clinical isolates in Kano. There is dearth of information on this subject in Kano.

**Method:** One hundred and eighty five (185) *S. aureus* isolates from various clinical specimens obtained over a 12-month period in the Microbiology Department of Aminu Kano Teaching Hospital (AKTH) were subjected to methicillin susceptibility testing, while including susceptibility testing to other antibiotics by the disc diffusion methods.

**Result:** Out of 185 *S. aureus* isolates tested, 53(28.6%) were found to be methicillin resistant. While 38(62%) isolates were obtained from in-patients, 15(28%) were from out-patients. Surgical wound infection had the highest prevalence of 32(60%) isolates. Antibiotics sensitivity results of methicillin susceptible staphylococcus aureus (MSSA) and MRSA with the third generation cephalosporins and the quinolones were encouraging. All MRSA isolates were sensitive to vancomycin.

**Conclusion:** A prevalence of 28.6% MRSA in this environment calls for urgent intervention strategies due to its possible rapid spread and therapeutic problem.

**Keywords:** MRSA, Prevalence, Antibiotic susceptibility, AKTH.

#### Introduction:

*S. aureus* has long been established as an important pathogen in human disease. The emergence of MRSA strains found in increasing number of infections and often multi resistant in nature now pose serious therapeutic problems to clinicians.

When penicillin was introduced in 1994, over 95% of staphylococci isolates were susceptible to the drug. Today, the proportion has shrunk to 10%. The resistance of *S. aureus* to various antibiotics and particularly to methicillin has

become a global nosocomial concern. The introduction and the use of gentamycin in the late 1960's and early 1970's halted the development of MRSA. However, by the late 1970's gentamycin resistant MRSA had emerged (1).

MRSA strains are usually resistant to several groups of broad spectrum antibiotics that are used on a large scale in the hospital. The mechanism of increased spreading under antibiotic pressure may have contributed to the

worldwide increase in the prevalence of MRSA in hospitals. (2)

The most remarkable feature of *S. aureus* is its ability to acquire resistance to antibiotics. Many resistance genes are acquired by plasmid mediated gene transfer and some may be transferred to the chromosome as mobile genetic elements. Methicillin resistant strains usually possess more than four genes encoding different resistant mechanism (3).

Classically, MRSA has been a nosocomial problem associated with long hospital stays, numerous or prolonged antibiotic courses, the presence of invasive devices and proximity to an already infected or colonised patient (4).

### Materials and methods

**Study Area:** Aminu Kano Teaching Hospital is a 500 bed tertiary hospital which also serves as a referral hospital for states surrounding Kano without such health facilities. It has emergency, general and specialist units for both pediatric and adult patients.

**Methods:** One hundred and eighty five (185) consecutive isolates of *S. aureus* were obtained over a 12-month period from various clinical specimens in the Medical Microbiology Department of AKTH by standard procedures (5). They were subjected to methicillin susceptibility testing by using Mueller-Hinton agar supplemented with 4% NaCl. Culture plates were inoculated by dipping a sterile cotton swab into a suspension of the overnight growth of the organism prepared to the density of a McFarland no. 0.5 standard, expressed

excess liquid from the swab and inoculated the surface of the agar by spread method. The 5µg methicillin discs (oxoid) were aseptically placed on the surface of the inoculated plates and incubated aerobically at 35°C for 24hrs. The isolates were also similarly inoculated into the surfaces of plain Mueller-Hinton agar plates and Ofloxacin (10µg), Ceftazidim (30µg), Ceftriaxone (30µg), Ciprofloxacin (5µg), Vancomycin (30µg) discs (Abbot Laboratories) were placed and also incubate at 35°C for 24hrs.

The zones of inhibition were measured and compared with National committee for clinical laboratory standards (NCCL) guidelines (6). The isolates that were resistant to the methicillin (<14mm) were termed methicillin resistant *S. aureus* (MRSA) while those with zone of inhibition as ( $\geq 14$ mm) were termed susceptible. Antibiotic susceptibility tests were carried out by modified Kirby-Bauer method (7).

**Results:** Out of 185 isolates of *S. aureus* testes 53(28.6%) were found to be methicillin resistant. Of the 53 MRSA isolates 38(62%) were obtained from In-patients, 15(28%) were from out-patients.

The percentage distribution of MRSA for each service unit is show in Tabe 1. Surgery department had the highest prevalence of 40% while General out-patient department (GOPD), Accident and emergency, Pediatrics, Special care baby unit and medical words had 20%, 4%, 3%, 6% and 17% respectively.

Table 2 shows the percentage distribution of isolates of MRSA from different clinical

specimens. Surgical wound infection showed the highest record with 60% while Ear swab, Urine from urinary tract infection, Skin swab and swab from Eye infections recorded 18%, 11%, 7, and 4% respectively.

Table 3 shows the antibiotic susceptibility of the MSSA and MRSA isolates to methicillin and six other antibiotics. While 71.4% of all the isolates were sensitive to methicillin, 28.6% were resistant. The antibiotic sensitivity profile of MRSA to various antibiotics was as follows,

Ciprofloxacin (64%), Ofloxacin (90%), Amoxicillin/clavulanic acid (31.7%), Ceftriaxone (75%), Gentamicin (18%) and Ceftazidim (79%). The percentage sensitive for the MSSA were recorded as follows; Methicillin (100%), Ciprofloxacin (68%), Ofloxacin (93%), Amoxicillin/clavulanic acid (62%), Ceftriaxone (90%), Gentamicin (75%) while Ceftazidime was (92%).

All the isolates were sensitive to Vancomycin.

**TABLE 1: DISTRIBUTION OF MRSA BY SERVICE UNIT AT AKTH, KANO**

SERVICE	No. POSITIVE (%)
GOPD	11 (20)
MEDICINE	9 (17)
SURGERY	21 (40)
PAEDIATRICS	7 (13)
SPECIAL CARE BABY UNIT	3 (6)
ACCIDENT & EMERGENCY	2(4)
TOTAL	53 (100)

**TABLE 2: DISTRIBUTION OF MRSA ISOLATES BY SOURCE OF SPECIMEN AT AKTH, KANO**

SITE OF INFECTION	No. POSITIVE (%)
SURGICAL WOUNDS	32(60)
EAR SWAB	10 (18)
URINE	6 (11)
SKIN	3 (77)
EYE SWAB	2 (4)
TOAL	53 (100)

**TABLE 3: ANTIBIOTICS SUSCEPTIBILITY PATTERN OF MSSA AND MSRA AT AKTH KANO**

S. aureus	No. OF ISOLATES (% SENSITIVE)						
	Meth	CIP	OFL	AMC	CRO	CN	CAZ
MSSA n=132	132 (100)	80 (61)	124 (93)	82 (62)	120 (90)	180 (75)	122 (92)
MRSA N= 53	53 (0)	34 (64)	48 (90)	26 (49)	45 (84)	10 (18)	42 (79)

Meth - Methicillin

CIP - Ciprofloxacin

OFL - Ofloxacin

AMC - Amoxicillin/clavulanic acid

CRO - Ceftriaxone

CN - Gentamyin

CAZ - Ceftazidim

## Discussion:

Although it was not possible to carry out a polymerase chain reaction (PCR) to detect *mecA* gene which is regarded as the gold standard for determining methicillin resistance, sensitivity to or not with 5µg methicillin discs (oxid) were used. This was the same method adopted by the other studies used for comparison with this present report. In this study, a prevalence rate of 28.6% MRSA was recorded. This is lower than the study in Jos (8) and Ilorin (9), Nigeria which had prevalence rates of 43% and 34.7% respectively.

In another study (10) comprising eight large hospitals in Africa and Malta, a prevalence rate of 16% was observed. MRSA was relatively high in Nigeria, Kenya and Cameroon (21-30%), and below 10% in Tunisia Malta and Algeria.

In Europe MRSA prevalence varied almost a 100 fold in a study, (11) from <1% in northern Europe to >40% in southern and Western Europe.

In the United States (12) the proportion of MRSA was rapidly increased from below 5% in the 1980's to 29% in 1991.

From the foregoing, it is clear the MRSA has become a global nosocomial pathogen with attendant therapeutic problems.

The low prevalence of 6% MRSA in the special baby care unit (SBCU) highlights the awareness interventions of the staff there to prevent nosocomial infection while the high prevalence of 40% in the surgical world would be attributed to lack of adequate

precaution and very limited infection control applications.

The antibiotic susceptibility results of MRSA in this study to third generation cephalosporins and the quinolones was quite encouraging and compared favorably well with the study from Ilorin (9). However, the study (8) at Jos showed a low percentage sensitivity of MRSA to the cephalosporins but good results with the quinolones.

This result will be of local clinical relevance in the treatment of MRSA in this environment especially when vancomycin is not commonly available in this area.

There should be an effective infection control committee to coordinate implementation of its policies especially regular hand washing and strict ward antisepsis to reduce nosocomial infections.

Although vancomycin resistant MRSA is not yet common in this part of the world, the rate of spread of this pathogen and its unique ability to acquire and transfer antibiotic resistance calls for urgent and well coordinated surveillance programme to combat this situation.

There should also be strict antibiotic prescription policies enforced by the appropriate authorities to contain the abuse of antibiotics and reduce acquisition of resistance by pathogens. Educational awareness should be encouraged to update

health care workers with new intervention strategies.

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