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A Twelve Month Surveillance of Methicillin Resistant *Staphylococcus aureus* (MRSA) at Jos Teaching Hospital, Nigeria

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ABSTRACT: A prospective surveillance of Methicillin Resistant *Staphylococcus aureus* (MRSA) was carried out at Jos University Teaching Hospital, Nigeria over a one-year period. This study highlights the continuous importance of MRSA in causing both hospital and to a less extent community acquired infections. Out of the 180 consecutive isolates of *S. aureus* tested, 78 (43%) were found to be methicillin resistant. 81% (63 isolates) of the MRSA were from hospital in-patients while 19% (15 isolates) were from out-patients. The highest rate of methicillin resistance (81%) was found in surgical wound infections while the special care baby unit (SCBU) service recorded 4%. 85% of the MRSA were sensitive to Ofloxacin while 46% were sensitive to Peflaxacin. Most MRSA isolates were multiply resistant to Augmentin, Ceftriaxone and Ceftazidime, thus confirming the nosocomial nature of the isolates. Vancomycin and teicoplanin are not locally available and so Ofloxacin is the drug of choice. The study has demonstrated a high prevalence of MRSA in our hospital, which definitely plays a significant role in hospital acquired infections. In conclusion, the relatively high prevalence of MRSA in this study has shown that there is a "limited" level of infection control activity in our hospital.

Key Words: Methicillin resistant *Staphylococcus aureus*; Prevalence; Susceptibility; Antibiotics.

Introduction

Hospital infections are all those infections acquired in hospital which were absent at the admission. A few of the patients become infected with some consequences for them such as complications and prolongation of hospital stay, for their communities such as diffusion of infection, and for the hospital as loss of time and resources because of the use of higher quantities of antibiotics. *Staphylococcus aureus* is a ubiquitous organism which is present in the anterior areas of approximately 40% of healthy adults is mainly transmitted by hand contact (1), and is frequently implicated in nosocomial infections. The most remarkable feature of *S. aureus*, however, 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 (2). Probably, the most significant achievement of *S. aureus* has been the acquisition of methicillin resistance. Emergence of MRSA made clinical use of vancomycin inevitable, and predisposed *S. aureus* towards acquisition of Glycopeptide resistance. MRSA is a generic term for all

S. aureus strains carrying MecA gene (3,4) and expressing certain levels of methicillin or oxacillin resistance.

Materials and Methods

(a) Study Area

Jos University Teaching Hospital (JUTH) is a 521 - bed tertiary hospital with acute, general and specialist units for both paediatric and adult patients. It also serves as a referral hospital.

(b) Method

The susceptibility of consecutive isolates of *S. aureus* (isolated within a 12 month period) to Oxacillin was determined on Mueller - Hinton agar supplemented with 2% NaCl. Plates were inoculated by dipping sterile cotton swabs into the suspension of the overnight growth of the organism prepared to a density of a McFarland No. 0.5 standard; expressed excess liquid from the swabs and inoculated the surface of the agar by the spread method. The 1 microgram Oxacillin discs were aseptically placed on the surface of the inoculated plates and incubated aerobically at 35°C for 18 - 24 hours. The isolates were also similarly inoculated onto the surfaces of plain Mueller Hinton agar plates and Augumentin (30mcg), Ofloxacin (10mcg), Pefloxacin (5mcg) and Ceftazidime (30mcg) discs were placed and incubated as above. The zones of inhibition were measured and compared with the NCCLS (5). The isolates that were resistant to Oxacillin ($\leq 10\text{mm}$ diameter) were termed methicillin Resistant *S. aureus* (MRSA) (5).

Results

This study describes a 12 - month audit of MRSA at JUTH. Out of 180 isolates of *S. aureus* tested, 72 (43%) were found to be methicillin resistant. The MRSA accounted for 66% (57 isolates) of *S. aureus* from hospital in-patients and 23% (21 isolates) of those from out-patients. The percentage distribution on each service in the hospital for MRSA are shown in Table 1. Surgical services had the highest prevalence of 46%, while general out-patient department (GOPD), medical, paediatric, Special Care Baby Unit (SCBU) and casualty wards had 15%, 12%, 19%, 4% and 4% respectively ($P < 0.05$).

Table 1: The Percentage Distribution on Each Service for MRSA at Jos University Teaching Hospital, Nigeria.

Service	GOPD	CAS	MED.	SURG	PAED.	SCBU	TOTAL
Number positive	12	3	9	36	15	3	78
% Positive	15	4	12	46	19	4	43

$$\chi^2 = 72.54, P < 0.05.$$

SYMBOLS: GOPD = General Out-patient Department; CAS = Casualty; MED. = Medicine; SURG. = Surgery; PAED. = Paediatrics; SCBU = Special Care Baby Unit.

Table 2 shows the percentage distribution of isolated MRSA from each site of infection. Surgical wound infection recorded the highest with 81% while cutaneous, urinary tract and eye infections recorded 8%, 8% and 4% respectively. ($P < 0.05$).

The susceptibility pattern of the 180 *S. aureus* isolates to Oxacillin and five other antibiotics is shown in Table 3. 57% of the isolates were sensitive to Oxacillin while 43% were resistant (MRSA). For Augmentin, 40% were sensitive while 92%, 12%, 76% and 10% of the isolates were sensitive to Ofloxacin, Ceftriaxone, Pefloxacin and Ceftazidime respectively.

The susceptibility pattern of the 78 MRSA isolates are shown in Table 4. 85% of them were sensitive to Ofloxacin while 46% were sensitive to Pefloxacin. The percentage sensitivities to Augmentin, Ceftriaxone and Ceftazidime were 9, 6 and 7 respectively. The percentage sensitivities for the non - MRSA were as follows:- Augmentin (64), Ofloxacin (100), Ceftriaxone (9) and Ceftazidime (6). Most MRSA isolates were multiply resistant to Augmentin, Ceftriaxone and Ceftazidime, thus confirming the nosocomial nature of the isolates.

Table 2: The Percentage Distribution of Isolated MRSA From Each Site of Infection at JUTH

Isolates	Pathogen Site %				
	MRSA	SWI	CUT.	UTI	EYE
% Distribution		81	8	8	4
Number		63	6	6	3

$$\chi^2 = 164.22; P < 0.05$$

Symbols

SWI = Surgical Wound Infection

CUT = Cutaneous

UTI = Urinary Tract Infection

EYE = Eye

Discussion

The study has highlighted the continuous importance of MRSA in causing both hospital and to a less extent community acquired infections. The relatively high prevalence (43%) of MRSA has shown that there is a "limited" level of infection control activity at JUTH. This must have accounted for the high prevalence of post-operative wound infections earlier reported by Ihezue *et al* (6) in the hospital. The highest prevalence of 46% in surgical services is attributed to the lack of adequate precautions in the surgical wards especially with respect to wound dressing. The low prevalence of 4% MRSA in SCBU is due to the increased awareness amongst the SCBU staff of the need to prevent nosocomial infection in that unit. It has been found out that control and surveillance of nosocomial infection does not have a priority at senior management levels within the hospital. Thus immediate infection control measures with emphasis on vigilant and careful handwashing before and after patient contact, strict isolation measures, culture surveillance, inter-hospital transfer policies and in-service education will ultimately reduce the incidence of nosocomial MRSA in our hospital. A very effective infection control committee in the hospital will help to co-ordinate the above measures as the costs of an MRSA outbreak both financially and psychologically cannot be over emphasized. In the absence of the glycopeptides (vancomycin and teicoplanin) in Nigeria, Ofloxacin and to a lesser extent pefloxacin are the antibiotics of choice for the treatment of MRSA

TABLE 3: PERCENTAGE SENSITIVITIES OF 180 S.aureus ISOLATES TO METHICILLIN AND 5 OTHER ANTIBIOTICS AT JUTH, NIGERIA.

Antibiotic = Methicillin	Augmentin		Ofloxacin		Ceftriaxone		Pefloxacin		Ceftazidime	
	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance
Sensitive	57	43	92	8	12	88	76	24	10	90
	(171)		(150)		(123)		(135)		(90)	

$$\chi^2 = 117.18; P < 0.05.$$

Figures in parentheses indicate the number of isolates tested, whenever these were less than the number isolated.

TABLE 4: PERCENTAGE SENSITIVITIES OF MRSA AND NON-MRSA ISOLATES TO 5 ANTIBIOTICS AT JUTH,NIGERIA.

Antibiotic	Augmentin		Ofloxacin		Ceftriaxone		Pefloxacin		Ceftazidime	
	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance
MRSA n = 78	9	91 (69)	85	15 (60)	6	94 (51)	46	54	7	93 (39)
Non_MRSA n = 102	64	36	100	0	9	91	97	3	6	94

$$\chi^2 = 157.69; P < 0.05.$$

Figures in parentheses indicate the number of isolates tested, whenever these were less than the number isolated.

infections in our local setting. In order to preserve the efficacy of these two drugs the following interventions should be implemented:- (a) prospective identification of patients at risk (risk profiling); (b) institution of proven preventive strategies; (c) rapid identification of infection sources in high risk individuals (d) monitoring the prevalence of antimicrobial resistance for individual pathogens and (e) appropriate selection of antibiotics and adjunctive therapy.

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