

THE CURRENT SUSCEPTIBILITY PATTERN OF METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* TO ANTIBIOTICS IN PORT HARCOURT

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ABSTRACT

The antimicrobial susceptibility pattern of methicillin-resistant *Staphylococcus aureus* (MRSA) from in-patients and out-patients at the University of Port Harcourt Teaching Hospital (UPTH) was studied. Fifty, *S. aureus* organisms were isolated from routine clinical specimens such as high vaginal, wound, urethral and ear swabs. The organisms were identified morphologically and biochemically by standard laboratory procedures. MRSA screening was performed using oxacillin disc diffusion test and the effects of five antibiotics against the 50 *S. aureus* isolates were investigated. Eighteen (36%) of the isolates were methicillin (oxacillin) resistant, of these 12 (24%) were from in-patients and 6 (12%) were from out patients. Eighty percent (80%) of the isolates were susceptible to Augmentin, 78% to Ceftriaxone, 58% to Ceftazidime, 92% to Aprofloxacin, 94% to Vancomycin and 64% to Oxacilin. There is an emerging trend of vancomycin resistance among *S. aureus* isolates from UPTH.

KEY WORDS: Staphylococcus, Port Harcourt, MRSA, Aureus

INTRODUCTION

Staphylococcus aureus is associated with a variety of clinical infections including septicemia, pneumonia, urinary tract infections, wound sepsis, septic arthritis, osteomyelitis and post-surgical toxic shock syndrome with substantial rate of morbidity and mortality¹. One of the reasons for the success of this organism as a human pathogen is its great variability, occurring at different periods and places with diverse types and antibiotic resistance patterns within regions and countries. Hospital acquired Staphylococcal infections are common in newborn babies, surgical patients and hospital staff. Patients develop sepsis in wounds which result from operation procedures². *Staphylococcus* food poisoning can also occur. Attempts to control these diseases by chemotherapy through the use of antimicrobial agents particularly antibiotics have resulted in increased prevalence of resistance to these agents³. Since the emergence of *S. aureus* strains with resistance to penicillin and methicillin in 1948 and 1961 respectively, it has become a well known etiologic agent of a wide variety of infections and assumed increasing importance internationally as causative agent of both hospital and community acquired infections. The most notable example of the phenomenon of antibiotic resistance in *Staphylococcus aureus* was the emergence of methicillin resistant *Staphylococcus aureus* (MRSA) which was reported one year after the launch of methicillin antibiotic⁴. MRSA is a bacterium responsible for difficult to treat infection in humans. The organism is often sub-categorized as community associated MRSA (CA-MRSA) or hospital associated MRSA (HA-MRSA) depending on the circumstance of acquiring disease⁵. CA-MRSA strains are generally susceptible to multiple antibiotics, which is in contrast to

the typical, multiple-drug resistant HA-MRSA strains⁶. This study was carried out to determine the frequency of MRSA isolates from different clinical specimens from in and out-patients of UPTH and to carry out a comparative study of the current antimicrobial susceptibility pattern of MRSA from these infections

MATERIALS AND METHODS

Staphylococcus aureus isolates were collected from routine clinical samples of high vaginal swab (HVS) wound swab (WS), ear swab (ES) and urethral swab (US) collected from the Department of Medical Microbiology, University of Port Harcourt Teaching Hospital (UPTH), Choba, Rivers-State, Nigeria. Isolation, characterization and identification of *S. aureus* was done as described by⁷. Six antibiotics were bought from Fidson Health Care Limited (Lagos, Nigeria) and used in this study. They are Penicillin (betalactam), - Oxacillin and Augmentin: Glycopeptides-Vancomycin: Fluoroquinolones- Ciprofloxacin and 3rd generation antibiotics Cephalosporins Ceftriaxone and Ceftazidime. All confirmed *S. aureus* were tested for methicillin resistance using the Kirby-Bauer disc diffusion method using oxacillin disc (lug/disc)⁷. The other 5 antimicrobial susceptibility test of all *S. aureus* isolates were also performed using the Kirby-bauer disc diffusion method. All antibiotics used in the study are shown in Table 1. The pattern of susceptibility or resistance of the organism was interpreted on the basis of the presence or absence of definite zone of inhibition, interpreted using the zone size interpretation chart provided by Fibson Health Care Limited, Lagos Nigeria. The zone sizes of each antimicrobial agent against *S.aureus* were reported as resistant, intermediate/moderately sensitive or sensitive (susceptibility).

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RESULT

A total of 50 *S.aureus* isolates were obtained, 19 (38%) were recovered from WS, 15 (30%) from HVS, US yielded 9 (18%) and ES yielded, 7 (14%) (Table 2). Eighteen (36%) were methicillin-resistant (MRSA or Oxacillin resistant ORSA) while 32 (64%) were methicillin susceptible. Twenty-five (50%) of the fifty isolates were from in-patients while 50% were from out

patients. Of the 18 MRSA, 12 (24%) were from in-patients while 6 (12%) were from out-patients. Of the 32 MSSA, 13(26%) were from in-patients and 19(38%) were from out patients (Table.1). Antimicrobial susceptibility data of the 50 *S. aureus* isolates are shown in Table 2. Fig 1 shows the percentage susceptibility of *S.aureus* to the various antibiotics used in this study.

Table 1.0 Classes, Representatives, and Concentrations of antibiotics

CLASSES	REPRESENTATIVES	CONCENTRATIONS
Penicilli (Beta-lactams)	Oxacillin and Agumentin (OX) (AUG)	1ug/disc and 30ug/disc
Glycopeptides	Vancomycin (VA)	30ug/disc
Fluoroquinolones	Ciprofloxacin (CF)	30ug/disc
Cephalosporins (3 rd generation)	Ceftriaxone (CRO) and Ceftazidime (CAZ)	30ug/disc and 30ug/disc

Table 2: Specimen type and antimicrobial susceptibility pattern of all *S.aureus* isolates

S/n	Specimen	Patient type	Number	Antibiotics														
				AUG		CRO		CAZ		CF		VA			OX			
				S	R	S	R	S	R	S	R	S	R	M	S	R	M	
1	W/S	IP	10	8	2	8	2	5	4	10	-	9	-	1	4	5	1	
		OP	9	9	-	7	2	5	4	9	-	8	-	1	6	2	1	
2	HVS	IP	5	1	4	3	2	3	2	3	2	3	2	-	2	3	-	
		OP	10	10	-	8	2	5	5	9	1	9	-	1	5	2	3	
3	E/S	IP	3	3	0	3	0	3	0	3	0	2	-	1	2	1	-	
		OP	4	3	1	3	1	3	1	4	0	4	-	-	3	1	-	
4	US	IP	7	5	2	5	2	3	4	6	1	3	1	3	3	3	1	
		OP	2	2	0	2	0	2	0	2	0	1	-	1	1	1	-	

Key: S= Sensitive, R= Resistant, IP= In-patient, OP=out- patient, M= Moderately sensitive

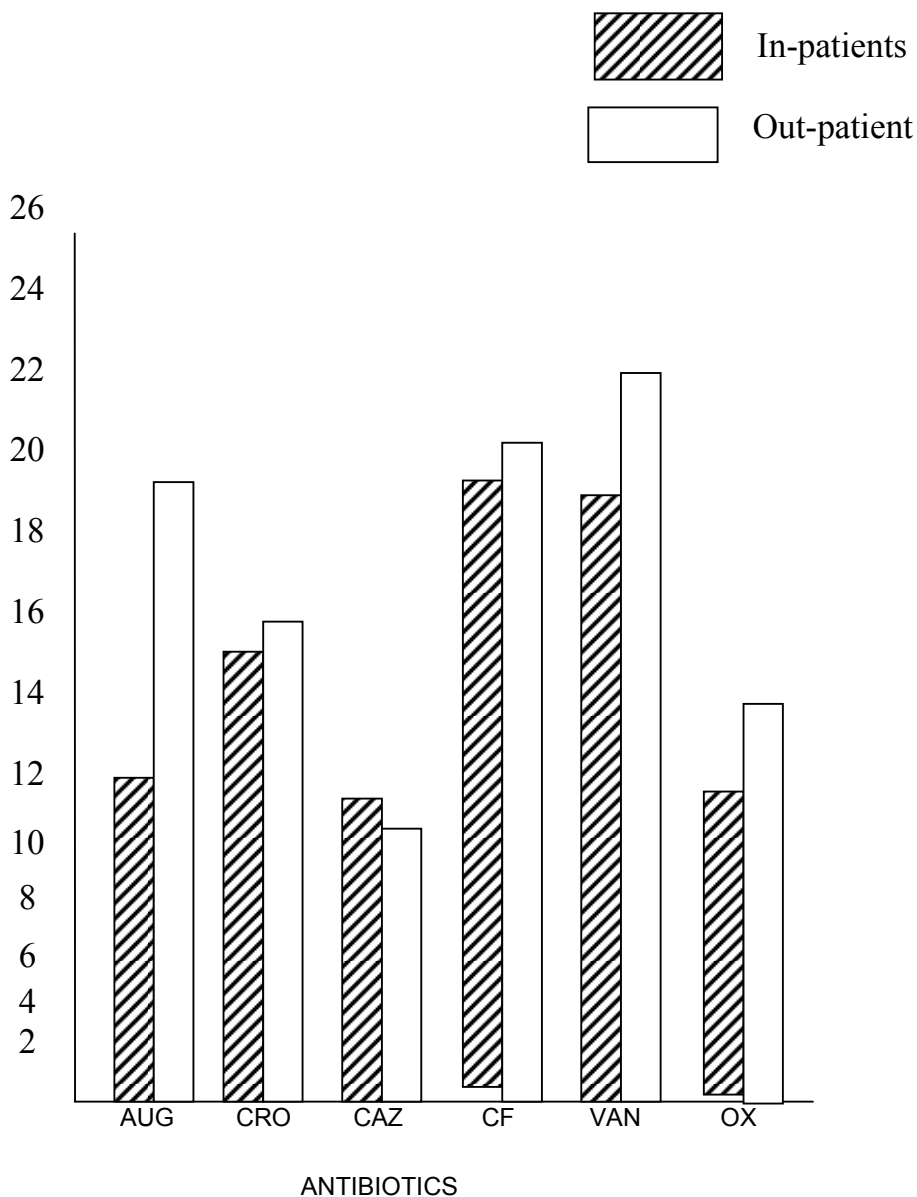


FIG 1: percentage susceptibility of the isolated organisms to the different antibiotics.

DISCUSSION

The aim of this study was to investigate the frequency of MRSA from different clinical specimens from in and out patients of the UPTH and to carry out a comparative study of the current antimicrobial susceptibility pattern of MRSA and MSSA from these patients in this locality. Fifty *S. aureus* organisms were isolated from four clinical specimen. 18(36)% of these were MRSA and 32(64%) were MSSA. This observation is similar to that of Metha and his co-workers who reported a total of 33% MRSA and 67% MSSA from wound and pus swabs in their study "Control of MRSA in a tertiary care centre"⁸. This study recorded a higher

prevalence of MRSA from in-patients than out-patients. This is probably because MRSA is considered a major nosocomial pathogen⁹. The important reservoirs of MRSA in hospitals are infected or colonized patients. Unclean hands of health care workers is also a predominant mode for patient to patient transmission¹⁰. Nineteen (38%) of the total number of isolates was recovered from wound swabs followed by 15 (30%) from HVS, 9(18%) from US and 7 (14%) from ES. The highest rate of MRSA isolates was recovered from wound swab specimens.¹¹ working in Canada reported that most of the patients with MRSA were older adults receiving care in medical or surgical units¹¹. The pattern has not changed as earlier reports by Swanston noted

more MRSA isolates from a surgical ward because of high usage of antibiotics in this facility¹².

MRSA infection on surgical wards is becoming increasingly common especially in critically ill patients who have spent prolonged periods in the intensive care unit¹³. Though this study was not designed to identify risk factors for MRSA acquisition, the risk factors previously associated with acquisition of MRSA, in hospitals include broad-spectrum antimicrobial therapy, admission to an intensive care unit, old age and proximity to other patients with MRSA¹⁴. In this study, 94% of *S. aureus* isolated showed susceptibility to Vancomycin with a high percentage of intermediate susceptibility. This is similar but different from the 100% susceptibility observed in Swanston's observation¹². The decreased susceptibility to Vancomycin may be as a result of treatment failure by some strains reported in Japan and the United States of America¹⁵. Therefore it is advised that hospital use of Vancomycin must be reserved for only critical situations e.g MRSA to protect this antibiotic from emerging resistance. In one study on spectrum of antimicrobial resistance among MRSA, Ciprofloxacin resistance was as high as 98.9% (Qureshi et al, 2004). This is in contrast to the observations in this study in which only about 50% of the MRSA strains are resistant to Ciprofloxacin. This study also observed that 80%, 75% and 55% of the isolates were susceptible to Augmentin, Cefraxome and Cetazidime respectively. The degree of resistance or susceptibility of MRSA to commonly used antibiotics is therefore recognized to be diverse from region to region. Significantly, we observed that CA-MRSA strains tended to be susceptible to more antibiotics than HA-MRSA strains. This may be due to widespread indiscriminate use of antibiotics in the hospital environment. In conclusion, the degree of resistance or susceptibility of MRSA to commonly used antibiotics is different from region to region, with Vancomycin still the drug of choice for treating multi drug resistant MRSA infections. There is therefore the need to minimize the antibiotic pressure that favours the selection of resistant strains of organisms. This will help in controlling the emergence of Vancomycin Resistant *Staphylococcus aureus* (VISA) in this hospital and the community. Ciprofloxacin can also be used in the management of MRSA infections in UPTH. This study recorded that 92% *S. aureus* were susceptible to Ciprofloxacin and a high percentage of the MRSA strains were also susceptible to this antibiotic.

To combat the increase in MRSA infections, in the hospitals and communities, a regular surveillance of hospitals and community associated infection, monitoring of antibiotic susceptibility pattern and formulation of definite antibiotic policy may be helpful.

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