ANTIBIOTIC SUSCEPTIBILITY PATTERN OF STAPHYLOCOCCUS AUREUS WITH SPECIAL REFERENCE TO METHICILIN RESISTANCE - A PRELIMINARY REPORT

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ABSTRACT

One hundred strains of *Staphylococcus aureus* isolated from various clinical samples were screened for methicillin resistance by the disc diffusion technique. Antibiotic susceptibility pattern of Methicillin sensitive *S. aureus* (MSSA) and Methicillin resistant *S. aureus* (MRSA) against a number of antibiotics like penicillin, ampicillin, gentamicin, erythromycin, tetracycline, Coamoxyclav cotrimoxazole, ciprofloxacin, cefalothin and vancomycin are compared. 20% of the strains were found to be MRSA while 80% were MSSA. The isolation rate of MRSA from indoor (hospital acquired) and outdoor (community acquired) was 18% and 2% respectively. Drug resistance of MRSA was highest with penicillin (100%), followed by erythromycin (80%), ampicillin and gentamicin (65%), tetracycline (60%), cotrimoxazole (55%), cefalothin (20%), Coamoxyclav (15%) and least against ciprofloxacin (5%) and vancomycin (0%). The MSSA were sensitive to vancomycin (100%), ciprofloxacin (100%), Coamoxyclav (96.25%), and cephalothin (82.5%) while sensitivity to tetracycline (78.75%), gentamicin (75%), erythromycin (40%), ampicillin (38.75%), cotrimoxazole (37.55%) and penicillin (21.25%) was much lesser. This study emphasizes the need for constant monitoring on the prevalence of MRSA and its microbial susceptibility pattern as the data would help clinicians in the effective management of nosocomial infections caused by *S.aureus*.

Key Words: *Staphylococcus Aureus, Methicillin, Sensitive, Resistant, Nosocomial Infection.*

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INTRODUCTION

Staphylococcus aureus has over the years proved its might as the most versatile and notorious pathogen. It has maintained its role as one of the commonest human pathogens in both community acquired and hospital acquired infections. It is also a notorious pathogen in producing a wide range of infections, more diverse than most other bacterial genera. Drug resistance in *S. aureus* has been a major problem over the years. Strains resistant to a variety of drugs, 'multiresistant' strains are commonly present in hospitals and may present a difficulty in therapy.¹ Over 90% of both hospital and community strains of *S. aureus* causing infection are resistant to penicillin.² With the introduction of methicillin in the nineteen sixties, a new resistant strain of *S. aureus* called Methicillin Resistant *Staphylococcus aureus* (MRSA) was discovered. MRSA have been reported worldwide and have been found to be responsible for outbreaks of nosocomial infections.³ Some strains associated with outbreaks are called Epidemic MRSA or EMRSA because once introduced they have a remarkable ability to spread within a hospital.^{4,5} Several hospitals have begun screening for MRSA, since infections caused by these strains significantly affect patient's morbidity and the hospital's reimbursement. Although it was previously thought that staphylococci are sensitive to vancomycin,⁶ recent reports of reduced susceptibility to vancomycin in some MRSA isolates has been rather disturbing.^{7,8,9}

This study was designed with the following objectives:

1. To study the prevalence of methicillin resistance among the strains of *S. aureus*
2. To determine the antibiotic susceptibility patterns of MRSA and MSSA strains against a panel of antibiotics.

MATERIALS AND METHODS

A hundred strains of *Staphylococcus aureus* isolated from various clinical samples received at the Clinical Microbiology Laboratory of Manipal Teaching Hospital, Pokhara were included in the study. Identification of *S. aureus* was based on morphology, colony characteristics and biochemical tests like catalase and coagulase tests. Antibiotic susceptibility tests of the strains were carried by the Kirby Bauer disc diffusion method. The antibiotics tested were penicillin (10 units), ampicillin (10mcg), gentamicin (10mcg), erythromycin (15mcg), tetracycline (30mcg), Coamoxyclav (30mcg), cotimoxazole (25mcg), ciprofloxacin (5mcg), cefalothin (30mcg), and vancomycin (30mcg). Methicillin susceptibility was carried out using methicillin disc (5mcg) placed on Mueller Hinton agar incubated at 30°C as well as Mueller Hinton agar supplemented with 6% NaCl incubated at 37°C as per standard procedures.¹ A standard strain of *S. aureus* ATCC 25923 was also included in the antibiotic susceptibility tests.

RESULTS

Out of the total of 100 strains of *S. aureus* included in the present study, 68% strains were obtained from pus samples, 12% from blood, 10% from urine, 6% from sputum and 4% from throat swabs. Of the pus samples, majority were from cases of wound infections (32) and pyoderma (26) followed by breast abscess (5), ear discharge (4) and a case of tropical pyomyositis (1).

20% of the strains were found to be MRSA while 80% were MSSA. Out of the 20 MRSA strains, 18 were isolated from pus samples, one from sputum and one was a urinary isolate. 18 of the 20 patients from whom MRSA were isolated, were inpatients while only 2 patients were those attending the OPD.

These 18 patients had undergone surgery and had developed hospital acquired wound infection. Therefore the overall isolation rate of MRSA from indoor (hospital acquired) and outdoor (community acquired) was 18% and 2% respectively.

The results of antibiotic susceptibility patterns of the isolates are given in table I.

Table 1

DRUG	DISC CONC. (µg/DISC)	MSSA (n=80)		MRSA (n=20)	
		No.	%	No.	%
PENICILLIN	10 units	17	21.25	0	0
AMPICILLIN	10	31	38.75	7	35
GENTAMICIN	15	60	75	7	35
ERYTHROMYCIN	30	32	40	4	20
TETRACYCLINE	30	63	78.75	8	40
AUGMENTIN	30	77	96.25	17	85
COTRIMOXAZOLE	25	30	37.5	9	45
CIPROFLOXACIN	30	80	100	19	95
CEFALOTHIN	30	66	82.5	16	80
VANCOMYCIN	30	80	100	20	100

A COMPARISON OF ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF MRSA STRAINS WITH MSSA STRAINS.

DISCUSSION

'Staphylococcus aureus' the bunch of cocci has always proved to be sour for microbiologists and clinicians alike. Our study highlights the problem of drug resistance among the isolates of *S. aureus* and also the prevalence of MRSA, which is about 20%. This correlates well with the findings of Harish and coworkers.¹⁰ Mathur et al from Lucknow have reported an isolation rate of 33.5%,¹¹ while a surveillance study of MRSA by Mehta et al from Mumbai showed an isolation rate ranging from 31.8% to 36.8%.¹² The percentage of hospitals isolating MRSA in the west has increased from 2% in '70's to 30% in '90's.¹³

In the present study, isolation of MRSA from hospitalised patients was quite high (18%) as compared to isolation of MRSA from outdoor patients (2%). The higher prevalence rate of MRSA

in hospitalised patients might be due to prolonged surgery, a long stay in the hospital, instrumentation and / or invasive procedures. Besides, the role of hospital personnel as carriers also needs a special mention because many outbreaks of MRSA infections in hospitals have been traced to hospital personnel.¹⁴

MRSA has emerged as one of the most important nosocomial pathogens and multidrug resistance is a common feature of MRSA.^{15,16} This has been reiterated in our studies which shows that drug resistance of MRSA was highest with penicillin (100%), followed by erythromycin (80%), ampicillin and gentamicin (65%), tetracycline (60%), cotrimoxazole (55%), cefalothin (20%), Coamoxyclav (5%) and least against ciprofloxacin (5%) and vancomycin (0%).

In comparison with the MRSA, the MSSA strains were more sensitive to various antibiotics as is evident from Table I. All the 80 strains were sensitive to ciprofloxacin and vancomycin, while many were resistant to penicillin and ampicillin. It is a well-established fact that most strains of *S. aureus*, even those acquired in the community are penicillin resistant. In most cases this resistance is attributable to plactamase production due to genes located on extra chromosomal plasmids.¹⁷ Though all the strains of MSSA were sensitive to ciprofloxacin, 5% of MRSA were resistant to it. Decrease in susceptibility to ciprofloxacin has also been reported in other studies though to a greater extent.^{10,12} Widespread use of ciprofloxacin even for simple infections in several hospitals has probably resulted in the emergence of resistant strains.

Susceptibility to vancomycin was 100% in both MSSA as well as MRSA strains. Though vancomycin remains the drug of choice for the treatment of infections with MRSA, recent reports of reduced susceptibility to vancomycin in some MRSA isolates have been rather disturbing.^{7,8,9}

Our study emphasizes the fact that the problem of MRSA looms large on us. There is a need for constant monitoring of its prevalence and antimicrobial susceptibility patterns as the data from such studies will help the clinicians in effective treatment of MRSA infections. However much needs to be done in evaluating the clinical importance of MRSA. Ongoing strategies to prevent nosocomial transmission include, vigorous attempts to identify infected or colonised patients as well as active screening of health care workers, treatment of wound sites and carrier sites with mupirocin ointment and cohorting of caregivers and patients.¹⁸

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