

Methicillin Resistant Staphylococcus Aureus (MRSA) at General Hospital, Colombo

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Staphylococcus aureus is one of the most versatile human pathogens. In the late nineteen thirties sulphonamides offered the first challenge to Staphylococcus aureus, but they failed because of their poor clinical performance in the presence of pus and resistance was seen to develop.

Benzyl penicillin was introduced in early nineteen forties. It solved the problem of treating staphylococcal infections, temporarily. From 1945 onwards penicillinase forming strains became increasingly common, first in the hospitals and subsequently in the general population and among animals. This was attributed to the continued use of penicillins.

The anti-staphylococcal penicillins such as, methicillin, oxacillin, and flucloxacillin, which were stable to beta lactamase came into clinical use in 1960¹.

Cephalosporins were introduced a few years later, thus adding to the β -lactam antibiotics available to treat staphylococcal infections. Around this time resistance to methicillin and other antistaphylococcal penicillins began to appear.²

Methicillin resistant staphylococcus aureus (MRSA) strains are often resistant to aminoglycosides and many other antibiotics. A study was undertaken to determine the prevalence of MRSA isolates in the hospital and to evaluate frequency of isolation in different units within the same hospital.

Methods

During a three month period 1434 pus samples were cultured. These were received in sterile culture swabs which were issued by the Bacteriology Department.

The samples were inoculated on to blood agar and MaConkey agar plates. After 24 hours of incubation at 37°C organisms were identified by their colonial morphology, gram stain coagulase production, and deoxyribonuclease (DNA-se) production. Antibiotic sensitivity testing was done on Mueller Hilton agar using Stokes method of disc diffusion and an Oxford strain of Staphylococcus aureus as a control³.

Results

We had 672 samples giving positive isolates of which 175 were Staphylococcus aureus isolates. 128 of Staphylococcus aureus isolates were from indoor patients, while 47 were from the Outpatient Department (OPD). (Table I)

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Table I
Wound Culture Results

Total No. of samples examined	1434
Total No. of positive isolates	672
Total No. of Staphylococcus aureus isolates	175
No. of Staphylococcus aureus isolates among indoor patients	128
No. of staphylococcus aureus isolates among outdoor patients	47

30 out of 128 (23.6%) from indoor patients and 5 out of 47 (10.6%) from outdoor patients were found to be resistant to methicillin. (Table II)

Table II
Percentage of MRSA Isolates

	<i>Indoor</i>	<i>Outdoor</i>
Total No.	30	5
Percentage	23.6	10.6

The highest rate of isolation (46.6%) of methicillin resistant Staphylococcus aureus was found in the Burns Unit, while 25% isolates of methicillin resistant Staphylococcus aureus was detected in Intensive Care Units and Dialysis Unit. The rate of isolation of methicillin resistant Staphylococcus aureus was 23.6% and 20% in Surgical wards and Dermatology Unit respectively. (Table III)

Table III
Rate of Isolation of MRSA in Different Units

Burns Unit	46.6%
Intensive Care Units	25%
Dialysis Unit	25%
Surgical wards	23.6%
Dermatology Unit	20%

Each of the 30 indoor isolates of Methicillin resistant Staphylococcus aureus was also resistant to gentamicin (MGRSA). However all were found to be sensitive to Netilmicin and 29 were sensitive to Amikacin, both of which are reserve aminoglycosides in the hospital.

The Methicillin resistant Staphylococcus aureus isolates were tested against penicillin, erythromycin, cotrimoxazole, tetracycline, gentamicin and fusidic acid which are considered front line antistaphylococcal agents in the hospital. Each of the isolates was found to be resistant to 3 or more of these six antistaphylococcal agents.

The sensitivity of MRSA isolates to cefuroxime, cefotaxime, ceftriaxone and ceftazidime varied between 35 to 75% while fusidic acid sensitivity was 86%.

Vancomycin which is the drug of choice for Methicillin resistant Staphylococcus aureus was not tested, because it is not registered in the country yet.

Discussion

Beta-lactam antibiotics act on specific targets which are called penicillin binding proteins, found on the inner surface of the bacterial cell membrane. These are enzymes that are involved in the terminal stages of assembling the bacterial cell wall and in reshaping the cell wall during growth and division⁴.

Methicillin resistant strains of Staphylococcus aureus produce a unique penicillin binding protein called "Penicillin binding protein 2a (PBP2a) or PBP2

that has low binding affinity, for beta-lactam antibiotics. Because of its low affinity PBP2a is not bound at concentrations of beta-lactam antibiotics that normally bind to high affinity penicillin binding proteins.

Presumably PBP2a can substitute for the functions of these penicillin binding proteins when they are bound by beta-lactam antibiotic, thereby producing resistance⁵.

In Methicillin resistant staphylococcus aureus PBP2a or PBP2² mediates clinically relevant resistance to all beta-lactam antibiotics and is encoded by an acquired chromosomal gene⁶.

In our study we found, that the rate of isolation of Methicillin resistant Staphylococcus aureus was significantly high at the General Hospital in Colombo.

The highest rate of isolation was seen in the Burns Unit. Significant number of patients were also detected having Methicillin resistant Staphylococcus aureus in Intensive Care Units, Dialysis Unit and Surgical Wards. (Table III)

Predisposing factors for development of MRSA include previous treatment with antibiotics and a long hospital stay.

Control measures in the spread of MRSA isolates within the hospital include screening the patients and the attending staff for carriage in the nose axillae and perinlum. Mupirocin applied locally on carriage sites have been found to be useful in eliminating these Staphylococci.

Summary

Methicillin resistant Staphylococcus aureus poses problems worldwide. During a three month period we had 128 isolates of Staphylococcus aureus from indoor patients and 30 were found to be MRSA (23.6%). Out of 47 isolates from outpatients 5(10.6%) were also found to the MRSA.

Each one of the 30 MRSA isolates was also resistant to gentamicin, (MGRSA) but all were found to be resistant to 3 or more of six front line antistaphylococcal agents tested. The sensitivity of MRSA isolates to Cefuroxime, Cefotaxime, Ceftriaxone and Ceftazidime varied between 35-75% while fusidic acid sensitivity was 86%.

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