Prevalence and antimicrobial susceptibility pattern of methicillin resistant Staphylococcus aureus in Silchar Medical College and Hospital, Assam, India

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INTRODUCTION

Staphylococcus aureus are commonly found on the skin and/or in the noses of healthy people. Though non-toxic at these sites, it may get into the body (e.g. through breaks in the skin such as abrasions, cuts, wounds, surgical incisions or indwelling catheters) and cause infections.¹

Methicillin-resistant Staphylococcus aureus (MRSA) were first reported in the early 1960's and are now regarded as a major hospital acquired pathogen worldwide. The term methicillin resistant is historically used to explain resistance to any of this class of antimicrobials.² It is one of the most common causes of hospital-acquired infection all over the world. Carriage of MRSA in nose, axilla, perineum and hand of patients and health care personnel (HCPs), prolonged duration of hospital stay, intravenous drug abuse and irrational use or over-prescription of antibiotics are important risk factors for MRSA acquisition. These factors along with the diversity in mecA gene (responsible for resistant mechanisms of MRSA isolates) pose a major challenge to prevent the spread of disease in both community and hospitals.³

The major reservoirs of Staphylococci in hospitals are colonized/infected in-patients and colonized hospital workers. Transient hand carriage of the organism by healthcare workers account for the major factor for patient to patient transmission. Constant monitoring of these strains is essential in order to control their spread in the hospital setting and spread to the community.⁴ It is very essential to know the prevalence of MRSA in any...
The antibiotic susceptibility testing was performed at the Microbiology department SMCH by using the Kirby Bauer’s’ disc diffusion technique following Clinical and Laboratory Standards Institute (CLSI) recommendations. Cefoxitin (30 μg) or oxacillin (1ug) were used for methicillin resistance detection. The Isolates using oxacillin were considered methicillin-resistant if the zone of inhibition was 10 mm or less. Isolates using cefoxitin disk diffusion showing an inhibition zone diameter of <19mm was considered as methicillin resistant and > 20 mm was considered as methicillin sensitive.

The other antibiotics were also tested. They are cefuroxime, amoxicillin and clavulanic acid, gentamicin, levofloxacin, ciprofloxacin, ceftriaxone, nitrofurantoin, amikacin, vancomycin and linezolid. The data thus obtained was recorded and analyzed by using appropriate statistical methods.

RESULTS

Table 1: Template for conducting the study.

<table>
<thead>
<tr>
<th>Date</th>
<th>Sex</th>
<th>Address</th>
<th>Type of specimen</th>
<th>Methicillin resistant staphylococcus aureus (MRSA)</th>
<th>Methicillin sensitive staphylococcus aureus (MSSA)</th>
<th>MRSA Strains showing resistance to other antibiotics</th>
<th>MSSA Strains showing resistance to other antibiotics</th>
</tr>
</thead>
</table>

The prevalence of staphylococcus aureus was seen to significantly vary among the different clinical specimens. They are given in Table 1. Overall the highest number of MRSA cases was seen from the pus sample (39.23%). The blood samples reported that among its samples showing positive staphylococci strains, the presence of MRSA strains was high (61.68%). Most of these cases were from the Intensive care unit (ICU) (63%). The urine specimens even showed a large number of MRSA strains (52.76%). Urine specimens were mostly collected from the medicine department. No MRSA cases were seen from the ear swab specimens during the study period.
It is also noteworthy that MRSA strains showed higher resistance to other group of antibiotics when compared to MSSA strains. For example in Table II, 59.4\% of MRSA strains showed resistance to cefuroxime whereas it was only 8.96\% of MSSA strains that exhibited cefuroxime resistance. Vancomycin and linezolid resistance was 0.71\% in MRSA strains. MSSA cases reported no resistance for ceftriaxone, vancomycin and linezolid.

**DISCUSSION**

In India, the importance of MRSA had been accepted relatively late and it emerged as a problem in the 80s and in the 90s.\(^5\) MRSA has been associated with significant morbidity and mortality and is a chief public health issue worldwide. In developing nations such as ours, the data relating to MRSA’s transmission dynamics still remain unsatisfactory.\(^7\) A study by Bilal Ahmed et al. reported MRSA strains to be 32.\(^5\) A study by LK Khanal and BK Jha accounted MRSA cases to be 68.\(^6\) A study by Dr. SK Kulkarni gave facts which showed MRSA cases even went up to 70.33\%.\(^4\) The research work by Sangeeta et al reported that overall MRSA prevalence was 42\% in 2008 and 40 per cent in 2009.\(^10\) Our study stated that MRSA accounted 42.96\% of the staphylococci cases, which showed it was almost following the similar trend with the rest of the country. A study by Kareem H. Alzoubi in Jordan reported the overall prevalence of MRSA to be 34\%, which was considered alarming as it was a newly established hospital.\(^11\) It mentioned that the highest number of cases belonged to the ICU units (57.6\%). Even in our study we found out that a large percentage of the MRSA cases were from the ICU (63\%).

A study by Anurupa et al in 2003 declared that maximum isolation of MRSA was from pus and wound swabs (52.5).\(^12\) The study by Ankur Goyal et al revealed out of all MRSA isolates, the highest prevalence was observed in pus samples (66.03\%) followed by urine (11.45\%) and blood and tips (9.16\%). The article by Sangeeta et al said that overall MRSA strains was highest for skin and soft tissue infections (64\% in 2008 and 61\% in 2009) followed by blood (48\%) and respiratory samples including bronchial washings, endotracheal secretions and sputum (41\%).\(^10\) A study by Purav Patel et al in a tertiary care teaching hospital, Western India also found out that skin and soft tissue infection (72.37\%) accounted for most of the MRSA cases.\(^3\) Our study revealed that the highest number of specimens accounting for MRSA strains were from the pus samples followed by blood and the urine specimens.

The pattern of antibiotic resistance also follows a similar trend. Resistance to other antibiotics was encountered more in MRSA strains in comparison to MSSA strains. The study by Purav et al showed that hospital acquired MRSA strains showed high resistance to gentamicin (61.54\%). The study by Aslam et al found that the MRSA strains were resistant to cefazolin and augmentin.\(^13\) In the study by Javid A Dar, among the 61 strains of MRSA, 56 strains were found resistant to other group of antibiotics.\(^4\) The research work by M Prakash revealed that the highest resistance showed by MRSA isolates was 38.10 percent against levofloxacin. All the other antibiotics which were tested in this study, i.e., ciprofloxacin, erythromycin, streptomycin and levofloxacin exhibited a sensitivity range of 62.0 to 82.0 percent.\(^14\) Likewise our study showed resistance to the other antibiotics to a level of 60\%. It is worth mentioning that the MRSA strains in our study showed resistance to vancomycin and linezolid (0.71\%).

**CONCLUSION**

The standard monitoring of antimicrobial susceptibility pattern of MRSA and creation of a definite antimicrobial policy may be helpful for stopping the numbers of these infections in the hospitals. Additional confirmatory study can be done by detection of mecA gene by PCR method, which is measured as the gold standard. This study also affirms the importance of proper usage of the antibiotics by the health care professionals in the hospital so as to prevent the antibiotics resistance.

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**REFERENCES**


