

# Study of antibiotic sensitivity pattern of methicillin-resistant *Staphylococcus aureus*

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## Abstract

There is a growing concern about the rapid rise in resistance of *Staphylococcus aureus* to antimicrobial agents. Our objective was to determine the prevalence and pattern of antibiotic sensitivity among Methicillin-resistant and Methicillin-sensitive *Staphylococcus aureus* in Surat, South Gujarat, India. Covering the period of three months from August-2004 to October 2004, we processed the samples of Pus, Urine, Blood, high vaginal swabs, Sputum, throat swabs, drains and ear swabs received from New Civil Hospital, Surat. Total 135 Staphylococci were isolated, out of which, 48 (35.55%) were coagulase positive. These coagulase positive Staphylococci isolates were screened for Methicillin-resistance by a slide latex agglutination kit for the rapid detection of PBP2' (Penicillin binding protein 2a). Sensitivity to amikacin, erythromycin, clindamycin and tetracycline were also carried out following Kirby Bauer disc diffusion method. Methicillin resistance among the *Staphylococcus aureus* isolates was 39.5%. Resistance to all antibiotics tested among the Methicillin-resistance and Methicillin-sensitive, staphylococci was found to be 26.3% and 6.8% respectively, which is statistically significant. Methicillin-resistance is a useful marker in selecting appropriate antimicrobial agents for treatment of infections caused by *S. aureus* changing pattern of resistance of *S. aureus* makes its periodic surveillance mandatory.

**Key words:** Antibiotics, coagulase positive staphylococci, methicillin resistant *Staphylococcus aureus*

## Introduction

Nosocomial infections account for morbidity and mortality of millions of patients annually, worldwide.<sup>[1]</sup> *Staphylococcus aureus* especially Methicillin-resistance *S. aureus* (MRSA) is relatively ubiquitous and is the cause of many community, endemic and epidemic nosocomial colonization and infections.<sup>[1]</sup> MRSA is of concern not only because of its resistance to Methicillin but also because it is generally resistant to many other chemotherapeutic agents (1). Since, MRSA strains are also resistant to multiple antibiotics there is possibility of

extensive outbreaks, which may be difficult to conclude.<sup>[2]</sup> Accurate detection of MRSA is an important prerequisite for appropriate therapy and epidemiological assessment of nosocomial infections caused by this strains.<sup>[2,3]</sup>

Although, the clinical significance of Methicillin-resistance has been questioned in the past there is now a widespread acknowledgement of the pathogenicity of MRSA. It has emerged as a significant cause of both nosocomial and community acquired infections. Furthermore, during the past decade there has been a steady increase in the incidence of infections caused by this bacterium.<sup>[4]</sup>

This study was undertaken to document the prevalence of Methicillin resistance among *S. aureus* isolates at tertiary care teaching hospital. The pattern of antibiotic

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susceptibility of both methicillin sensitive and methicillin resistant isolates to the commonly used antimicrobial agents was also analyzed.

Currently, the treatment options for MRSA infections are limited to very few and expensive drugs like teicoplanin, vancomycin and linezolid. Thus, control of MRSA is essential to curtail the introduction and spread of infection.<sup>[5]</sup>

## Materials and Methods

This study was carried out in Government Medical College, which is attached to New Civil Hospital, which caters the healthcare needs of South Gujarat Region. From August-2004 to October 2004, we processed the samples of Pus, Urine, Blood, high vaginal swabs, Sputum, throat swabs, drains and ear swabs received from New Civil Hospital, Surat (Source of specimen shown in Table 1). Total 135 Staphylococci were isolated out of which 48 (35.55%) were coagulase positive. The isolates were confirmed by Colony Smear, Gram Staining, Catalase Test, Gross and Microscopic Morphology, Positive Coagulase, Mannitol Fermentation following standard procedures.

MRSA screening was done by A Slide Latex Agglutination kit for the rapid detection of PBP2' (Penicillin binding protein 2a). Antimicrobial susceptibility to Amikacin, Erythromycin, Clindamycin and Tetracycline were carried out following Kirby Bauer disc diffusion method, using paper disks with indicated strengths. All tests were performed on Muller-Hinton agar (Himedia, India) and were interpreted after incubation for 24h at 37°C. The zone diameters were measured around each disc and were interpreted on the basis of guidelines published by the NCCLS.

**Table 1: Number of isolation of coagulase positive *Staphylococcus aureus* and MRSA from different clinical samples**

Sample	Coagulase positive <i>Staphylococcus aureus</i>	MRSA
Pus	20	11
Blood	11	5
Urine	5	1
Sputum	3	1
Throat swab	2	0
Drain	2	0
High vaginal swab	2	0
Ear swab	3	1
Total	48	19 (39.5%)

## Results

Out of 135 isolates of Staphylococci 48 strains were coagulase positive and 87 were coagulase negative. Out of 48 coagulase positive Staphylococci 19 (39.50%) isolates were resistant to Methicillin. Table 2 shows the antibiotic resistance pattern of Methicillin resistant and sensitive strains of *Staphylococcus aureus*.

As many as five (26.3%) Staphylococcus strains were resistant to all antibiotics tested and two (6.8%) were resistant to all other antibiotics except Methicillin. Co-existing resistance to different antibiotics except Clindamycin with Methicillin was significantly higher in comparison to Methicillin sensitive strains.

## Discussion

Despite, intensive efforts to control resistant organisms by aggressive infections control methods antibiotic-resistant Staphylococci, especially MRSA has become the most common cause of hospital acquired infections worldwide.<sup>[1]</sup> The present study highlights the problem of MRSA in a referred hospital in South Gujarat. In this study using the Latex agglutination test kit, the frequency of MRSA was determined, 39.5%, which is similar to Assam, yet it is very high in comparison to the records of other hospitals in India.<sup>[2,3]</sup> The injudicious use of antibiotics in Pakistani hospitals and because of the easy availability of antibiotics without prescription, the chances of the emergence of resistant strains is enhanced. Lack of public awareness has further deteriorated the situations.<sup>[6]</sup>

Many investigators have reported an increase in the incidence of MRSA during recent years, most of which originated from wounds (pus).<sup>[1,6]</sup> We also found a high rate of MRSA isolates i.e. 26.3% from the clinical specimens

**Table 2: Antibiotic sensitivity pattern of methicillin resistant and sensitive strains of *Staphylococcus aureus***

Antibiotics	Methicillin Resistant (n = 19)	Methicillin Sensitive (n = 29)	P value
Clindamycin	13 (68.4%)	20 (68.4%)	>0.05 (Not significant)
Erythromycin	12 (63.1%)	10 (34.4%)	>0.05 Not significant
Tetracycline	12 (63.1%)	8 (27.5%)	<0.05 significant
Amikacin	10 (52.6%)	9 (31.03%)	>0.05 Not significant

P value indicates statistically significant differences between Methicillin resistant and sensitive strains

also showed multiple drug resistance. In our study two (6.8%) MSSA (Methicillin sensitive *Staphylococcus aureus*) isolates were resistant to all other antibiotics tested. We have observed in our study that resistance to different antibiotics among MRSA strains was significantly higher than those, which were sensitive to Methicillin.

Amikacin, which was proposed to be an alternative therapy to MRSA infection, were found to be still better in this part of the country (52.6%). This is perhaps due to the different clonal expansion and drug pressure in the community.

Since, complete eradication of MRSA may not be possible, control of transmission seems to be the appropriate goal. The efficacy of some controlling methods are widely recognized and recommended by most authors. The first and the most effective way among these are to avoid transmission through hand contamination by the person responsible for caring the infected patients. The use of broad-spectrum antibiotics for treating infections also increases the rate of MRSA and other resistant bacteria.<sup>[1]</sup> Therefore chemotherapy should be guided by sensitivity of the probable causative organism. Accurate detection of MRSA by clinical laboratories, the route of its transmission in the community and the risk factors for infection such as antimicrobial and parental drug use should be declared. Because the ability of staphylococci to change over the time, the MRSA will continue to be a problem in the future, as it has been in the past and still is, at present.<sup>[1,3]</sup>

## Conclusion

Injudicious use of antibiotics will lead to development of drug resistant. One should always look for methicillin resistant in isolates of staphylococcus as the treatment option for methicillin resistant strains are limited. Also there is resistant to other antibiotics in Methicillin resistant strains. Timely detection of methicillin resistant strain will help in prevention of hospital-acquired infections.

## References

1. Mansouri S, Khaleghi M. Antibacterial resistance pattern and frequency of Methicillin resistant *Staphylococcus aureus*. *Iran J Med Sci* 1997;22:93.
2. Majumder D, Sarma Bordoloi JN, Phukan AC, Mahanta J. Antimicrobial susceptibility pattern among Methicillin resistant *Staphylococcus aureus* isolates in Assam. *Indian J Med Microbiol* 2001;19:138-40.
3. Anupurba S, Sen MR, Nath G, Sharma BM, Gulati AK, Mohapatra TM. Prevalence of Methicillin resistant *Staphylococcus aureus* in a tertiary referral hospital in Eastern Uttar Pradesh. *Indian J Med Microbiol* 2003;21:49-51.
4. Alborzi A, Pourabbas BA, Salehi H, Pourabbas BH, Oboodi B, Panjehshahin MR. Prevalence and pattern of antibiotic sensitivity of Methicillin sensitive and resistant *Staphylococcus aureus* in Shiraz-Iran. *Iran J Med Sci* 2000;25:1-8.
5. Siddiqui F, Madahiah-bint-e-Masood, Noor-us-Saba, Samad A, Quayyum M, Qazilbash AA. Antibiogram sensitivity pattern of Methicillin resistant *Staphylococcus aureus* isolates from pus sample. *Pak J Biol Sci* 2002;5:491-3.
6. Vidhani S, Mehndiratta PL, Mathur MD. Study of Methicillin resistant *S. aureus* (MRSA) isolates from high risk patients. *Indian J Med Microbiol* 2001;19:13-6.

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