



## Original Research Article

### Prevalence of Methicillin Resistant *Staphylococcus aureus* in tertiary care hospital, Central India

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#### ABSTRACT

##### Keywords

Methicillin resistant *Staphylococcus aureus*, Coagulase negative, resistant, sensitive, antimicrobials

MRSA has been considered the most representative nosocomial pathogen over the past decades. MRSA is now endemic in India. Hence, early detection of MRSA and effective antibiotic policy in referral hospitals are of paramount importance from the hospital epidemiological point. The present study has been carried out with an aim to know the antibiotic sensitivity pattern of Staphylococcal isolates with special reference to MRSA. A total of 285 strains of Staphylococci isolated from persons having different staphylococcal diseases were included in the study. Methicillin resistance was shown by 112 (58.33%) of the coagulase positive and 12 (12.9%) coagulase negative strains. Higher resistance to multiple antimicrobials in methicillin resistant strains as compared to methicillin sensitive strains was found to be statistically significant. In the present study all the MRSA strains as well as non-MRSA strains were found sensitive to vancomycin and Linezolid

#### Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) first emerged as a serious infectious threat in the late 1960s as the bacterium developed resistance to methicillin. (Washer and Joffe, 2006) Life threatening sepsis, endocarditis and osteomyelitis caused by methicillin resistant *Staphylococcus aureus* (MRSA) have been reported from several parts of the world. (Couto *et al.*, 1995, Cox *et al.*, 1995) MRSA has been considered the most representative nosocomial pathogen over the past decades. (DeLeo and Chambers, 2009) MRSA infections in hospitals have obviously imposed a high burden on healthcare

resources as well as significant morbidity and mortality (Boucher and Corey, 2008). It is not surprising then, that MRSA has been the focus of intense scientific and political interest around the world and has frequently been labelled as a superbug in the popular media (Easton *et al.*, 2009).

MRSA is now endemic in India. The incidence of MRSA varies from 25 per cent in western part of India (Patel *et al.*, 2010) to 50 percent in South India (Goplakrishnan and Sureshkumar, 2010). The prolonged hospital stay, indiscriminate use of antibiotics, lack of awareness, receipt of antibiotics before coming to the hospital etc.

are predisposing factors of MRSA emergence (Anupurba *et al.*, 2003). Hence, early detection of MRSA and effective antibiotic policy in referral hospitals are of paramount importance from the hospital epidemiological point. Therefore, the knowledge of prevalence of MRSA and their current antimicrobial profile become necessary in the selection of appropriate empirical treatment of these infections.

The present study has been carried out with an aim to know the antibiotic sensitivity pattern of Staphylococcal isolates with special reference to MRSA.

## Materials and Methods

Methicillin-resistant *Staphylococcus aureus* (MRSA) first emerged as a serious infectious threat in the late 1960s as the bacterium developed resistance to methicillin (Washer and Joffe, 2006). Life threatening sepsis, endocarditis and osteomyelitis caused by methicillin resistant *Staphylococcus aureus* (MRSA) have been reported from several parts of the world. (Couto *et al.*, 1995; Cox *et al.*, 1995) MRSA has been considered the most representative nosocomial pathogen over the past decades. (DeLeo and Chambers, 2009) MRSA infections in hospitals have obviously imposed a high burden on healthcare resources as well as significant morbidity and mortality (Boucher and Corey, 2008). It is not surprising then, that MRSA has been the focus of intense scientific and political interest around the world and has frequently been labelled as a superbug in the popular media (Easton *et al.*, 2009).

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antibiotics, lack of awareness, receipt of antibiotics before coming to the hospital etc. are predisposing factors of MRSA emergence. (Anupurba *et al.*, 2003) Hence, early detection of MRSA and effective antibiotic policy in referral hospitals are of paramount importance from the hospital epidemiological point. Therefore, the knowledge of prevalence of MRSA and their current antimicrobial profile become necessary in the selection of appropriate empirical treatment of these infections.

The present study has been carried out with an aim to know the antibiotic sensitivity pattern of Staphylococcal isolates with special reference to MRSA.

## Results and Discussion

Out of 285 isolates of staphylococci 192(67.36%) strains were coagulase positive and 93 (32.63%) were coagulase negative.

A total of 112 (58.33%) of the coagulase positive staphylococci strains shows resistance to methicillin and 12 (12.9%) coagulase negative strains showed methicillin resistance.

Methicillin resistance was consistent when tested with oxacillin as well as methicillin in coagulase positive strains but 6.5% of coagulase negative strains showed sensitivity with methicillin discs though they were labelled as resistant with oxacillin discs.

Nineteen (23.75%) staphylococci strains were resistant to all the antibiotics tested and 6 (8.75%) were resistant to all other antibiotics except methicillin.

Co-existing resistance to different antibiotics with methicillin resistant strains was significantly higher in comparison to methicillin sensitive strains (p values).

**Table.1** *Staphylococcus aureus* isolated in various clinical samples

SN	Clinical Samples	Number of <i>S. aureus</i> isolates
1	Pus	76 (67.85%)
2	Blood	4 (3.57%)
3	Respiratory Samples	20 (19.64%)
4	Urine	5 (4.46%)
5	Other samples (ear swabs, nasal swabs, skin swabs and fluids)	7 (6.25%)

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

Antibiotics	Methicillin Resistant n=112 Resistant	Methicillin Sensitive n=80 Resistant	p-value*
Gentamicin	77 (68.75%)	32 (40%)	P=0.0006
Tetracycline	62 (55.35%)	19 (32.75%)	P< 0.0001
Erythromycin	32 (28.57%)	23 (28.75%)	P=0.978
Ciprofloxacin	25 (22.32%)	6 (8.75%)	P=0.006
Clindamycin	59 (52.67%)	14 (17.5%)	P< 0.0001
Co-trimoxazole	68 (60.71%)	22 (27.5%)	P< 0.0001
Linezolid	0	0	
Vancomycin	0	0	

\*p value indicates statistically significant differences between methicillin resistant and sensitive strains.

Highest number of strains showed resistance to gentamicin followed by co-trimoxazole, tetracycline, clindamycin, erythromycin and ciprofloxacin. Coexisting ciprofloxacin and methicillin resistance was seen in 22.32% of strains, whereas among the methicillin sensitive strains ciprofloxacin resistance was only 8.75%.

MRSA is a major nosocomial pathogen causing significant morbidity and mortality (Sachdev *et al.*, 2003).

In India, the significance of MRSA had been recognized relatively late and it emerged as a problem in the 80s and in the 90s. Epidemic strains of these MRSA are

usually also resistant to several other antibiotics. During the past 15 years, the appearance and world-wide spread of many such clones have caused major therapeutic problems in many hospitals, as well as diversion of considerable resources to attempts at controlling their spread (Barid, 1996).

In this study, the prevalence and antimicrobial susceptibility patterns of various MRSA isolates obtained from different clinical samples were determined. We isolated 112 MRSA strains from 285 clinical specimens (Table 1).

As high as 67.85% of MRSA strains were obtained from pus specimens and 19.64%

of strains were obtained from respiratory samples. Similar observation was made by Qureshi from Pakistan who reported a high isolation rate of up to 83% MRSA from pus (Qureshi, 1996).

However, Mehta, who in his study on control of MRSA in a tertiary care center, had reported an isolation rate of 33% from pus and wound swabs (Mehta *et al.*, 1998)

MRSA isolates of our study were multidrug resistant. Majumder from Assam had reported 23.2% of the MRSA isolated from clinical specimens to be multidrug resistant. (Majumder *et al.*, 2001) Anupurba from Uttarpradesh had reported a higher percentage of multidrug resistant MRSA (Assadullah *et al.*, 2003). Vidhani from Delhi reported even a higher percentage of multidrug MRSA but from high risk patients admitted in burns and orthopedic units (Vidhani *et al.*, 2001).

In the present study all the MRSA strains as well as non-MRSA strains were found sensitive to vancomycin and Linezolid which is in concordance with the study of Joshi *et al.* (2013)

In conclusion, the degree of resistance or sensitivity of MRSA towards commonly used antimicrobials is recognized to be diverse from region to region. Thus, antimicrobial therapy inevitably requires the need for *in vitro* susceptibility testing of every isolate of MRSA in the clinical laboratories. Our study is a preamble to enable epidemiologists to understand the antimicrobial sensitivity pattern of MRSA isolates in this part of India (Table 2).

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