

## Original Research Article

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## Prevalence and Antimicrobial Susceptibility pattern of Methicillin Resistant *Staphylococcus aureus* Isolates at a tertiary Care Hospital in Rajkot, Western India

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### ABSTRACT

Prevalence and Antimicrobial Susceptibility Pattern of Methicillin Resistant *Staphylococcus aureus* Isolates at a tertiary Care Hospital in Rajkot, Western India. Aim of the study is to analyse the prevalence and the antimicrobial Susceptibility pattern of Methicillin Resistant *Staphylococcus aureus* (MRSA). A total of 300 clinical samples were taken from various sites and the pathogen was identified as *Staphylococcus aureus* based on gram stain, various biochemical tests and culture. Subsequently the antibiotic susceptibility test was performed and MRSA was detected from it. Out of the total 300 samples of *S. aureus*, 76 (25%) were found to be Methicillin Resistant *Staphylococcus aureus* (MRSA). Hospital acquired MRSA was more common than Community Acquired MRSA. All clinical samples were resistant to penicillin, 48.68% to ciprofloxacin and levo floxacin, 23% to cotrimoxazole, 9.21% to tetracycline, 6.57% to gentamycin, 3.94% to chloramphenicol. All the samples were sensitive to linezolid, vancomycin and rifampicin. Conclusion: The regular surveillance of hospital-acquired infections of MRSA may be helpful in formulating and monitoring the antibiotic policy & in preserving antibiotics like vancomycin, only for life-threatening staphylococcal diseases.

#### Keywords

MRSA, Prevalence

#### Article Info

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### Introduction

Methicillin Resistant *Staphylococcus* is a leading cause of gram positive bacterial infections and produces a wide spectrum of diseases, ranging from minor skin infections to fatal systemic ones (Debbie Josefson, 1997). After the emergence of MRSA as a nosocomial pathogen in the early 1960s, there has been an increase in the number of MRSA outbreaks both in the hospitals and the

community at large (Bruce R. Lyon *et al.*, 1987). Early detection of MRSA and formulation of effective antibiotic policy in tertiary care hospitals is of paramount importance from the epidemiological point.

The present study has been carried out in our teaching hospital with an aim to know the prevalence and antibiotic susceptibility pattern of Methicillin Resistant *Staphylococcus aureus* isolates, in order to utilize the

information obtained and formulate the antibiotic policy and appropriate control measures.

## Materials and Methods

This study was aimed to find the prevalence of MRSA and its susceptibility pattern at our teaching hospital at Rajkot, West India, for a period of 9 months. A total of 300 isolates of *S. aureus* were obtained from various clinical specimens of different wards and OPDs like pus, wound swab, blood, sputum, urine, body fluids, vomitus and food.

The specimens were cultured on blood agar and MacConkey agar plates and incubated aerobically at 37°C for 48 hours (Gerald Collee *et al.*, 1996). The isolates were identified using standard tests like gram stain, catalase, slide and tube coagulase and mannitol test (Washington *et al.*, 2005).

They were then subjected to antibiotic susceptibility testing by modified Kirby Bauer's disc diffusion method on Muller Hinton Agar plates using various antibiotic discs like penicillin G (10 units).

Gentamicin (10ug), levofloxacin (5ug), ciprofloxacin (5ug), erythromycin (15ug), clindamycin (2ug), tetracycline (30ug), cotrimoxazole (1.25/23.75ug), linezolid (30ug), chloramphenicol (30ug) as per CLSI guidelines.

Test for methicillin resistance was performed by Kirby-Bauer disc diffusion method using cefoxitin (30ug) disc on Muller-Hinton agar (HiMedia Labs, Mumbai). The agar plate was previously inoculated with 0.5 McFarland standard bacterial suspension, the cefoxitin disc (30ug) was placed & after 16-18 hours of incubation at 33-35°C, the zone of inhibition was observed (Clinical Laboratory Standards Institute, 2017).

All *S.aureus* strains were tested for susceptibility to cefoxitin disc diffusion test for detection of MRSA (Clinical Laboratory Standards Institute, 2017) along with other antibiotic discs.

MRSA – 21 mm or less diameter of inhibition zone of cefoxitin

MSSA – 21 mm or more diameter of inhibition zone of cefoxitin

Cefoxitin is used as a surrogate for mecA-mediated oxacillin resistance (Clinical Laboratory Standards Institute, 2017). Isolates that test as mecA positive should be reported as oxacillin (not cefoxitin) resistant; routine testing of other  $\beta$ -lactam agents, except those with anti-MRSA activity, is not advised.

Quality control (QC) of the various tests and also of the antibiotic discs was performed with *S. aureus* ATCC 25923, according to the standard disc diffusion QC procedure. Additional QC was performed with separate in-house selected *S. aureus* strains that demonstrated sensitive and resistant to cefoxitin.

## Results and Discussion

A total of 300 isolates of *Staphylococcus aureus* were studied over a period of 9 months in the Microbiology Laboratory at a tertiary hospital, Rajkot. Of them 25% (76) samples were found to be of MRSA and 75% (224) samples were found to be of MSSA.

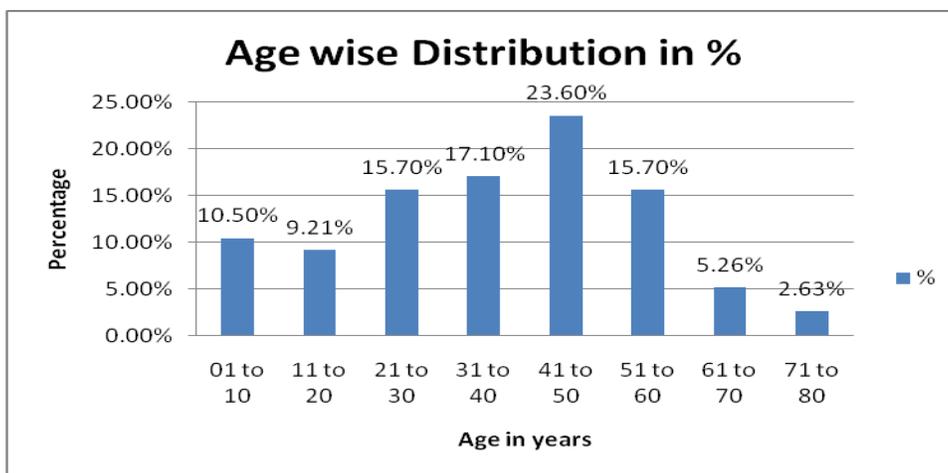
Out of all the 76 samples, 69.7% (53) samples were of pus (SSTI), blood samples were 25% (19), DLC tip, pleural fluid, sputum and urine samples were 1.31% (1) each. Females were predominant with 54% (41) than males at 46% (35). The age group distribution is as follows; 41-50 years were maximum at 23.60%, followed by 31-40years at 17.10%, 21-30

years and 51 -60 years were at 15.70%, 01-10 years were at 10.50%, 11-20 years at 9.21%, 61-70 years at 5.26%, and 71-80 at 2.63% (Table 1). Based on the patients' history and admission, 34% (26 isolates) had CA-MRSA and 66% (50 isolates) had HA-MRSA.

The antibiotic resistance in MRSA was as follows: Penicillin was maximum with 100% (76), Ciprofloxacin 48.68% (37), Levofloxacin 48.68% (37), cotrimoxazole 23% (18), Tetracycline 9.21% (7), Gentamicin 6.57% (5), Chloramphenicol 3.94% (3) and no resistance to vancomycin, linezolid and rifampicin. In urinary samples, resistance was seen in trimethoprim while no resistance was

seen in norfloxacin and nitrofurantoin (Table 2). In the present study, of the total 300 samples, MRSA is seen in 25% (76) of the isolates and MSSA in 75% (224) of the isolates. Similar results were observed by Gupta *et al.*, (2009), Jadhav Savita Vivek *et al.*, (2011), INSAR group (2013), McNeil *et al.*, (2013) and Yoo Sang *et al.*, (2016) (Table 3). On the contrary, some studies have reported alarming high incidence of MRSA; reports from a Delhi hospital have shown the MRSA prevalence of 51.6% in 2001 (Tiwari *et al.*, 2008), whereas it was reported as 38.44% in the same hospital in 2008. The epidemiology of MRSA over different parts of India is not uniform.

**Table.1** Age wise distribution



**Table.2** Antimicrobial resistance in MRSA samples

Drugs	R	S
Cotrimoxazole	18 (23%)	58
Tetracycline	7 (9.21%)	69
Chloramphenicol	3 (3.94%)	73
Ciprofloxacin	37(48.68%)	39
Levofloxacin	37(48.68%)	39
Gentamicin	5 (6.57%)	71
Penicillin	76 (100%)	0
Vancomycin	0	76
Linezolid	0	76
Rifampicin	0	76

**Table.3** Methicillin sensitivity

STUDY	YEAR	MRSA	MSSA
V Gupta <i>et al.</i> ,	2009	25%	75%
Jadhav <i>et al.</i> ,	2011	32.5%	67.84%
INSAR group	2013	41%	59%
McNeil <i>et al.</i> ,	2013	31%	69%
Yoo Sang <i>et al.</i> ,	2016	47.4%	52.6%
Present Study	2016	25.33%	74.67%

**Table.4** Hospital acquired and community acquired MRSA

STUDY	YEAR	HA -MRSA	CA – MRSA
Debasmita <i>et al.</i> ,	2013	65%	35%
Kiran <i>et al.</i> ,	2015	54.85%	45.15%
Abbas A <i>et al.</i> ,	2015	71.1%	28.9%
Present Study	2016	66%	34%

**Table.5** Based on site

STUDY	YEAR	SSTI	OTHER SITES
Timothy <i>et al.</i> ,	2003	75%	25%
Scott <i>et al.</i> ,	2005	77%	23%
Present Study	2016	67%	33%

Multidrug resistance among MRSA strains was higher than those that were susceptible to methicillin. Ciprofloxacin was proposed to be an alternate therapy for MRSA infection (Sharon *et al.*, 1989). Although rapidly developing resistance to ciprofloxacin has been reported, the antibiotic was found working on *S. aureus* in our hospital. This is perhaps due to the differential clonal expansion and drug pressure in the community. In the present study, based on the patients' history and admission, 66% MRSA was found to be Hospital acquired and 34% MRSA was found to be community acquired. Similar results were observed by Debasmita *et al.*, (2013), Kiran *et al.*, (2015) and Abbas *et al.*, (2015) (Table 4).

In the present study, out of 300 cases, 67% (201) samples were of skin and soft tissue infections. 33% (99) cases were from other sites including systemic infections and blood cultures. Similar observations were made by

Timothy *et al.*, (2003) and Scott *et al.*, (2005) (Table 5).

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