# Prevalence and Antibiotic Susceptibility of Methicillin Resistant *Staphylococcus aureus* Isolates in a Tertiary Care Centre.

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**Abstract:**

**Introduction:**
Staphylococcus aureus produces a wide range of infections from soft skin infections to fatal septicemia. The prevalence of Methicillin resistant Staphylococcus aureus (MRSA) has increased drastically in Indian wards, of many which areresistant to antibiotic treatment.

**Aim:**
To study the prevalence rates and antibiogram pattern of MRSA from various clinical samples in a tertiary care Centre.

**Materials and Methods**:
A total of 434 various clinical samples received in Microbiology Laboratory, Tertiary care Centre, Chennai was included in study during the period from October 2016 to December 2016. A total 120 Staphylococcus aureus isolated, were identified by standard biochemical methods. Antibiotic susceptibility testing was performed by Kirby Bauer Disc Diffusion method. Methicillin resistance was detected by using cefoxitin (30µg) disc diffusion method as per CLSI guidelines 2016.

**Result**:
In our study120 (27.6%) of S.aureus was isolated from various clinical samples, out of which 23.3% were MRSA. MRSA was predominantlyisolated from pus samples. The resistance rate of MRSA isolates to antibiotics were 100% penicillin, 63% cotrimoxazole, 57.8% ciprofloxacin, 52.6% Erythromycin, 42.1% Clindamycin, 31.5% gentamycin and tetracycline, 21.05% amikacin, 3% Linezolid. All strains were sensitive to teicoplanin.

**Conclusion:**
Isolation of MRSA patients and carriers in the hospitals, regular surveillance, and monitoring of antibiotic susceptibility pattern of the hospital and community of that region regularly and formulation of antibiotic policy may help in reducing the treatment failures.

**Key words:**MRSA, MSSA, vancomycin, linezolid, S.aureus

## INTRODUCTION:

Methicillin-resistant Staphylococcus aureus (MRSA) is associated continuously with significant morbidity and mortality[1].It is most common cause of bacteremia, respiratory and skin infections.[2] Transmission of methicillin resistance to Staphylococcus aureus in hospital and community settings and growing prevalence of these strains,presents a significant clinical challenge to the management of serious infections worldwide.

In India, MRSA is the predominant pathogen causing skin and soft tissue infections. MRSA is especially troublesome in hospitals and nursing homes where patients with open wounds, invasive devices and weakened immune systems are at a great risk of nosocomial infection (hospital acquired infection) than the general public.

The prevalence of MRSA worldwide is increasing ranging from 23.3 % to 81%. MRSA is endemic in India. The incidenceof MRSA varies according to the region, 25% in western part of India[3] to 50% in South India[4].Community acquired MRSA (CA-MRSA) has been increasingly reported from India[5].

To determine the prevalence and antibiotic susceptibility of methicillin resistant Staphylococcus aureus (MRSA)from various clinical samples.

## MATERIALS AND METHODS:

A total of 434 various clinical samples like pus, sputum, urine and blood received in microbiology laboratory in a tertiary care centre, Chennai,during the period from October 2016 to December 2016was included in the study. Thespecimens were cultured on blood agar and MacConkey agar plates and incubated aerobically at 37°C for 48 hours. The culture positive for S.aureus was included for the study.The isolates were identified using standard tests like catalase, slide and tube coagulase, and growth on Mannitol salt agar.[6] Antibiotic sensitivity testing was performed by Kirby–Bauer disc diffusion method for the following antibiotics: amikacin (30 µg), ciprofloxacin (5 µg), clindamycin(2 µg), cotrimoxazole (1.25/23.75 µg), gentamicin (10 µg), erythromycin (15 µg),, penicillin (10 units), Tetracycline (30µg) Linezolid (30 µ)and Teicoplanin (30 µg). Results were interpreted according to the criteria of CLSI2016.[7]

**Detection of methicillin resistant Staphylococcus aureus:**
Detection of methicillin resistant Staphylococcus aureus was done by cefoxitin disc diffusion method. A lawn culture of the test isolate of 0.5 Mac Farland turbidity was done in Muller Hinton agar plate, cefoxitin disc (30µg) was placed on it and incubated overnight at 35◦C. A zone of

inhibition of ≤21mm were considered as methicillin resistant Staphylococcus aureus.[7]

## RESULT:

Out of total 434 samples 120(27.6%) were Staphylococcus aureus. MRSA were isolated from 28 (23.3%) out of 120 strains. MRSA strains were predominantly from pus samples (63.15%), urine(21.05%), blood (5.26%), and sputum (5.26%) Figure1. Comparison of resistance pattern of MRSA and MSSA were shown in figure 2. MRSA isolates shows high level of resistance to many antibiotics compared to MSSA.MRSA is highly susceptible to linezolid and Teicoplanin. All strains susceptible to Teicoplanin.
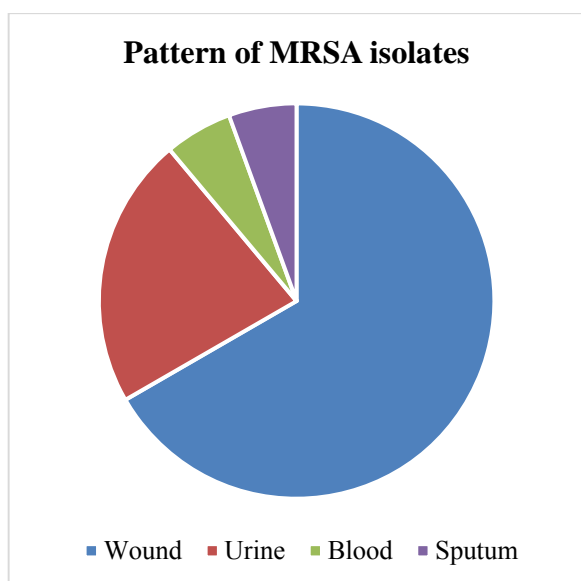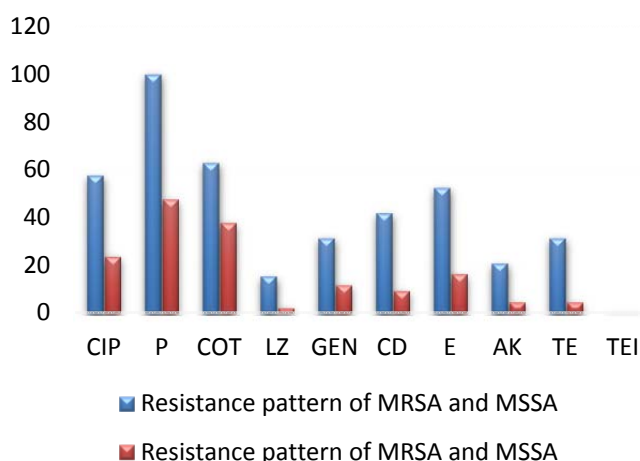


Figure 1



Figure 2
CIP-Ciprofloxacin,P-Penicillin, COT- cotrimoxazole, LZ-Linezolid, GEN-Gentamicin, CD-Clindamycin, AK-Amikacin, E-Erythromycin, TE-Tetracycline, Tei-Teicoplanin.

## DISCUSSION:

S.aureus is versatile pathogen causing a variety of infections ranging from mild skininfections to fatal septicemia worldwide.[8]there are various factors which contributed to the virulence factors and drug resistance, by which the organism has ability to establish and cause recurrent infections. MRSA has increased drastically since its establishment from 1961. In our study Prevalence of MRSA was 23.3% in concordance with Trivedi et al study[9]. The MRSA prevalence in India was found to be 42% in 2008 and 40% in 2009 in a multihospital based study[10] by Indian network for surveillance of Antimicrobial Resistance (INSAR) group.In this study MRSA was predominantly isolated from pus sample(67%) which is in accordance with other studies[9, 10, 11] followed by urine (21.05%), blood (5.26%) and sputum (5.26%) sample.

The incidence of MRSA varies worldwide from 2.3 to 81 %. Hence knowledge of resistance pattern of isolates is important clinicallyand epidemiologically. Antimicrobial resistance patterns results are of great concern due to these predominant bacterial isolates which are highly resistant to commonly available antimicrobial agents.[12]

High level of resistance was seen in cotrimoxazole (63%), ciprofloxacin (57.8), in concordance with other studies[13, 14, 15] Erythromycin (52.6%), clindamycin (42.6%), Gentamycin (31.5%), tetracycline (31.5%), amikacin (21.05) and linezolid (15.7%). MSSA strains were less resistant to antibiotics compared to MRSA isolates, cotrimoxazole (38%), ciprofloxacin (23.8%), Erythromycin (16.6%), clindamycin (9.5%), Gentamycin (31.5%), tetracycline (4.8%), amikacin (4.8%) and linezolid (2.3%). Limitations of the study: As vancomycin disc diffusion misclassifies the intermediate susceptible strains as sensitive. Hence we have not included vancomycin. MIC is the method recommended for vancomycin sensitivity for Staphylococcus aureus by CLSI guidelines 2016.[7]

## CONCLUSION:

MRSA is a versatile, well equipped pathogen with the potential to evolve and adapt to its host as well as to the treatments developed to control its invasive damage. Clearly, new therapies are needed in the ongoing struggle. MRSA shows great variation in different regions from time to time based on its usage factor. Hence isolation of MRSA patients, constant monitoring of the antibiotic susceptibility pattern and regulating the antibiotic policy will be needful in controlling the spread of resistance isolates.

## REFERENCES:

[1] Klevens R.M., Morrison M.A., Nadle J., Petit S., Gershman K., Ray S. Invasive methicillin-resistant *Staphylococcus aureus* infections in the United States. JAMA. 2007; 298(15):1763–1771.

[2] D. J. Diekema, M. A. Pfaller, F. J. Schmitz, Bell J. J Smayevsky, R. N. Jones, M. Beach, SENTRY Participants Group: Survey of infections due to Staphylococcus species: frequency of occurrence and antimicrobial susceptibility of isolates collected in the United States, Canada, Latin America, Europe, and the Western Pacific region for the SENTRY Antimicrobial SurveillanceProgram, 1997–1999. Clinical Infection Disease 2001, 32 (Suppl 2):114-132.

[3] Patel AK, Patel KK, Patel KR, Shah S, Dileep P. Time trends in the epidemiology of microbial infections at a tertiary care centre inwest India over last 5 years. J Assoc Physicians India 2010; 58:37-40.

[4]  Gopalakrishnan R, Sureshkumar D. Changing trends in antimicrobial susceptibility and hospital acquired infections over an 8 yearperiod in a tertiary care hospital in relation to introduction of an infection control programme. J Assoc Physicians India 2010; 58:25- 31.

[5]  D'Souza N, Rodrigues C, Mehta A. Molecular characterization of Methicillin-resistant *Staphylococcus aureus* with emergence of epidemic clones of sequence type (ST) 22 and ST 772 in Mumbai, India. J Clin Microbiol. 2010; 48:1806–11.

[6]  Bailey & Scott's, Diagnostic Microbiology, 20th edition, chapter 13, 222

[7]  Clinical and Laboratory Standards Institute, Performance Standards for Antimicrobial Susceptibility testing; 22nd informationsupplement, M100-S22 Wayne, PA; 2012.

[8]  *Staphylococcus aureus* Infections:Franklin D. Lowy, M.D.N Engl J Med 1998; 339:520-532.

[9]  Trivedi MB, Mahendra V, Sumeeta S: Prevalence of methicillin-resistant Staphylococcus aureus in various clinical samples in a tertiary-care hospital samples in a tertiary-care hospital. Int J Med Sci Public Health 2015; 4:1735-1738.

[10]. Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group, India, Methicillin resistant Staphylococcus

aureus(MRSA) in India: Prevalence & susceptibility pattern, Indian J Med Res 137, 2013, 363-369.

[11]  Shah VP, Mundra N, Vachhani N, Shah HY, Gadhvi H, Shingala H, et al. All prevalence and antibiotic susceptibility pattern of methicillin-resistant Staphylococcus aureus in a tertiary care hospital, Jamnagar, Gujarat. Int J Sci Res 2012; 1(3):2277–9.

[12]  Ojulong J, Mwambu TP, Jalooba M, Bwanga F, Kaddu-Mulindwa DH. Relative prevalence Methicillin-Resistant Staphylococcus aureus and its susceptibility pattern in Mulago Hospital, Kampala, Uganda. Tanzania J Health Research. 2009; 11(3):149–153.

[13]  Rajaduraipandi K, Mani KR, Paneerselvam K, Mani M, Bhaskar M, Manikandan P. Prevalence and antimicrobial susceptibility pattern of methicillin resistant *Staphylococcus aureus*: A multicentre study. Indian J Med Microbiol. 2006;24:34–8.

[14]  Qureshi AH, Rafi S, Qureshi SM, Ali AM. The current susceptibility patterns of methicillin resistant *Staphylococcus aureus* to conventional antimicrobials at Rawalpindi. Pak J Med Sci. 2004; 20:361–4.

[15]  Pulimood TB, Lalitha MK, Jesudasan MV, Pandian R, Selwyn JJ. The spectrum of antimicrobial resistance among methicillin resistant *Staphylococcus aureus* in a tertiary care in India. Indian J Med Res. 1996; 103:212–5.