Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com/journal/sjams/home

OPEN ACCESS

Microbiology

Prevalence and Antibiogram of Methicillin Resistant Staphylococcus Aureus at a Tertiary Care Hospital at Jaipur

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| **Received:** 27.01.2019 | **Accepted:** 07.02.2019 | **Published:** 16.02.2019
DOI: 10.36347/sjams.2019.v07i02.024

Abstract **Original Research Article**

Introduction: Staphylococci have become one of the most common causes of nosocomial infections. Multidrug-resistant staphylococci pose a growing problem for human health. The rise of drug-resistant virulent strains of *Staphylococcus aureus*, particularly methicillin-resistant *S. aureus* (MRSA) is a serious problem in the treatment and control of staphylococcal infections. ***Aim:*** To evaluate the prevalence of methicillin resistant *S.aureus.* ***Materials and methods:*** Methicillin resistance detection was performed using cefoxitin disc (30µg). Isolates of *S. aureus* showing zone of inhibition ≤ 21 mm & CoNS < 24 mm were considered as methicillin resistant (*mec* A positive). ***Results:*** Methicillin resistance detection was performed using cefoxitin disc (30µg). Isolates of *S. aureus* showing zone of inhibition ≤21 mm & CoNS< 24 mm were considered as methicillin resistant (*mec* A positive). ***Conclusion:*** Increasing prevalence of MRSA is posing a great challenge**.** Rational use of antibiotics, institutional antibiotic policy and proper hand hygiene may help to counter this challenge.

Keywords: Methicillin-resistant *Staphylococcus aureus* (MRSA), *S.aureus*, beta lactam antibiotics, penicillin binding protein, and Methicillin resistant coagulase negative Staphylococcus (MRCoNS), vancomycin screen agar.

INTRODUCTION

The resistance to antimicrobial agents is an increasingly global problem worldwide, especially among nosocomial pathogens. Staphylococci have become one of the most common causes of nosocomial infections. Multidrug-resistant staphylococci pose a growing problem for human health. The rise of drug-resistant virulent strains of *Staphylococcus aureus*, particularly methicillin-resistant *S. aureus* (MRSA) is a serious problem in the treatment and control of staphylococcal infections [1, 2]. *Staphylococcus aureus* is a leading cause of nosocomial and community-acquired infections in every region of world. The increasing prevalence of methicillin resistance among Staphylococci is an increasing problem.

Methicillin-resistant *Staphylococcus aureus* (MRSA) strains harbour the mecA gene which encodes a modified penicillin-binding protein (PBP2a) having low affinity for methicillin and all β-lactam antibiotics. Resistance to this antibiotic implies resistance to all β-lactam antibiotics leaving few therapeutic options to treat such severe infections. So, rapid and accurate identification of MRSA is required to immediately start the appropriate antimicrobial therapy and to avoid the spread of these strains [3-5].

MATERIALS AND METHODS

The present study was carried out on clinical specimens (pus, aspirates, blood, body fluids, respiratory secretions, central line/neck line/umbilical catheter tips, etc.) received in Bacteriology section, Department of Microbiology, SMS Medical College, Jaipur from 1st April 2016 to 31st March 2017. A number of Eighty three *Staphylococcus aureus* were isolated from various specimens were included in the study.

Isolates were identified and confirmed as per laboratory standard operative procedure (SOP) by the conventional morphological and biochemical tests.

Detection of antimicrobial resistance

All the isolates were subjected to Antimicrobial susceptibility testing by Kirby Bauer disc diffusion test for the following set of antibiotics as recommended by CLSI guidelines [6, 7].

Following antibiotics were used including penicillin (10 units), ceftaroline (30µg), erythromycin (15 µg), clindamycin (2 µg), ciprofloxacin (5 µg), cefoxitin (30 µg), doxycycline (30 µg), amikacin (30 µg), gentamicin (10 µg), norfloxacin (10 µg),

chloramphenicol (30 □g), fusidic acid (30 µg), trimethoprim- sulfamethoxazole (TMX)(1.25/23.75 µg), nitrofurantoin (300 µg), linezolid (30 µg) and vancomycin was tested by vancomycin screen agar (6 µg/mL BHI agar screen).

Detection of methicillin resistance

Methicillin resistance detection was performed using cefoxitin disc (30µg). Isolates of *S. aureus* showing zone of inhibition ≤21 mm & CoNS< 24 mm were considered as methicillin resistant (*mec* A positive)[6,7].

RESULTS

Prevalence of methicillin resistance *Staphylococcus aureus* among various clinical samples during our study was observed to be 53.01% (44 isolates). No significant difference in antimicrobial resistance was observed between MRSA and MSSA except for erythromycin and clindamycin. Among MSSA 15.4% and MRSA 59.1% *S.aureus* were resistant to erythromycin (P = <0.01). Similar results was observed with clindamycin, MSSA was 23.1% sensitive as compared to MRSA 52.2% (P=0.01). Susceptibility of MSSA and MRSA to amikacin, vancomycin and linezolid was 100% while resistance to penicillin was 100%.

Table-1: Pattern of methicillin resistant and methicillin sensitive *Staphylococcus aureus* among various clinical isolates

	Number of isolates	Percentage
MRSA	44	53.01%
MSSA	39	46.99%
Total	83	100

Table-2: Antibiogram of MRSA and MSSA

Antimicrobial agent	MRSA; N=44		MSSA; N=39		P valve LS
	R	S	R	S	
Penicillin	44(100%)	0(0%)	39(100%)	0(0%)	NA
Amikacin	0(0%)	44(100%)	0(0%)	39(100%)	NA
Erythromycin	26(59.1%)	18(40.9%)	5(15.4%)	34(84.6.5%)	<0.001S
Doxycycline	15(34.1%)	29(65.9%)	7(17.9%)	32(82.1%)	0.16NS
Ciprofloxacin	18(41%)	26(59%)	15(38.5%)	24(61.5%)	1NS
Nitrofurantoin	6(13.6%)	38(86.4%)	3(7.6%)	36(92.4%)	0.61NS
Clindamycin	23(52.2%)	21(47.8%)	9(23.1%)	30(76.9%)	0.01S
Quinupristin- dalfopristin	12(27.3%)	32(72.7%)	5(12.8%)	34(87.2%)	0.18NS
Linezolid	(0%)	44(100%)	(0%)	39(100%)	NA
Fusidic acid	10(22.7%)	34(77.3%)	7(17.9%)	32(82.1%)	0.79NS
Chloramphenicol	5(11.3%)	39(88.7%)	3(7.6%)	36(92.4%)	0.84NS
Trimethoprim- sulfamethoxazole	18(40.9%)	26(59.1%)	15(38.5%)	24(61.5%)	0.99NS
Vancomycin *	0(0%)	44(100%)	0(0%)	39(100%)	NA

**Vancomycin screen agar*

MRSA - Methicillin resistant *S.aureus*

MSSA - Methicillin sensitive *S.aureus*

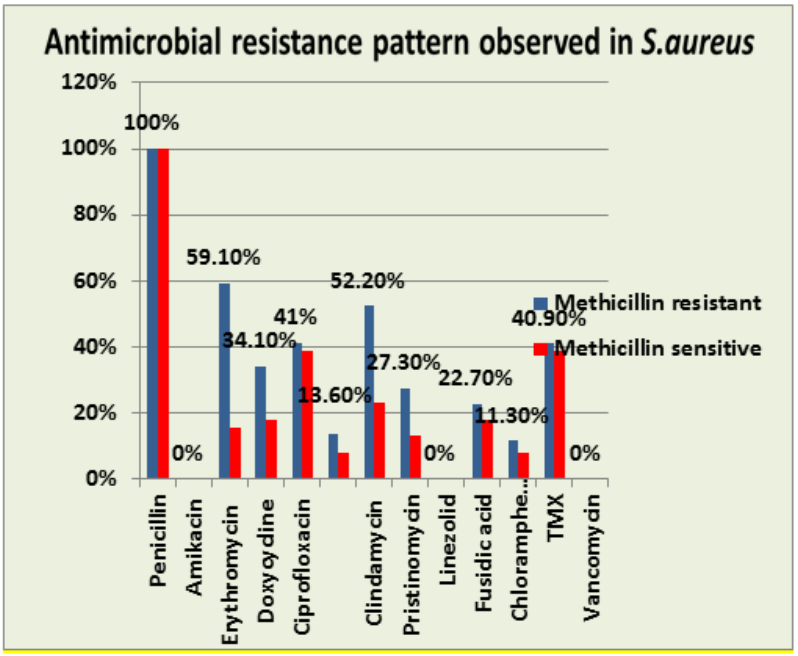

Fig-1

DISCUSSION

The proportion of MRSA has increased worldwide since last two decades. Its prevalence varies markedly across different countries and among hospitals of the same country. In this study the prevalence rate of MRSA was 53.01% (44/83) which coincides with prevalence observed in studies done in other parts of India [8-12]. Prevalence of MRSA observed in other studies ranged between 20-45% [13-17].

CONCLUSION

The emergence of drug resistance among Staphylococci is an increasing problem worldwide. Methicillin resistant *S. aureus* (MRSA) including MRCoNS are notorious nosocomial pathogen and their rate has dramatically increased in the recent years. The prevalence rate of methicillin resistance *Staphylococcus aureus* was observed as 53.01% in various clinical samples. Misuse of antibiotics can be a main reason for the spread of MRSA. Rational use of antibiotics, institutional antibiotic policy and proper hand hygiene may help to counter this challenge.

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