

Original Research Article

Study of antibiotic resistance profiling of *Staphylococcus aureus* isolated from clinical specimens of the patients attending a tertiary teaching hospital from Chhattisgarh

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ABSTRACT

Background: *Staphylococcus aureus* is a pathogen causing wide spectrum of infections. It has tendency for the development of multidrug resistance thereby exposing the selection of appropriate treatment. Therefore, the present study was undertaken to find out the antibiotic susceptibility pattern of *Staphylococcus aureus* isolated from various clinical samples in teaching tertiary hospital.

Methods: Total 85 *Staphylococcus aureus* was isolated from clinical samples (pus, urine, sputum and blood) tested. Identification of *Staphylococcus aureus* was done by standard conventional microbiological methods. Antibiotic susceptibility testing was done by using disk diffusion method as per CLSI guidelines.

Results: *Staphylococcus aureus* was isolated maximum from pus samples followed by urine samples. Antibiotic susceptibility testing showed highest resistance against Penicillin (69%) and Erythromycin (51%) followed by Cotrimoxazole (50%) & Nitrofurantoin (50%). All the strains were sensitive to Vancomycin. Amongst the urine isolates all were sensitive to Norfloxacin. These percentages of sensitivities are characteristically higher in our study than the previous studies in the literature. In addition, out of 85 *Staphylococcus aureus* isolates, 26 isolates showed sensitivity to all antibiotics.

Conclusions: From the present study we conclude that though the *Staphylococcus aureus* is usually having multidrug resistance pattern. So regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. This will be beneficial to preserve the effectiveness of antibiotics and for better patient management.

Keywords: Antibiotic resistance, MRSA, MSSA, *Staphylococcus*

INTRODUCTION

In spite of being a commensal *Staphylococcus* causes severe type of infections. Methicillin resistant *Staphylococcus aureus* (MRSA) infection may affect widely which may lead to treatment failure. Also, the organisms have the infection ability to spread in community particularly health care facilities.¹

Antimicrobial therapy is vital to the management of patients suffering from staphylococcal infections. There may be geographical variability in the antibiogram of the isolates. Exposure of antibiotics is one of the reasons for it. Many times, it is responsible for the outbreaks.^{2,3} The rate of drug resistance varies from community to community due to variation in drug pressure and exposure of the particular antibiotics. Very few reports

from Chhattisgarh state is noticed. Taking this in consideration, it is aimed to study the antibiogram of the *Staphylococcus aureus* isolated from various clinical samples from June 2015 to December 2015 in patients attended a teaching hospital. The aim and objective of this study was to isolation and identification of *Staphylococcus aureus* from the clinical samples of patents attending our tertiary care teaching hospital. To study the antibiogram of *Staphylococcus* isolated from the clinical specimens.

METHODS

Retrospective study was conducted from June 2015 to December 2015 at tertiary care teaching hospital in Chhattisgarh. All the isolates of *Staphylococcus aureus* isolated from clinical samples were included during the study period.

Age and sex of the patients were noted. 85 *Staphylococcus aurei* were isolated from clinical samples like pus, urine, body fluids & blood of all the age group of the patients. Identification of *Staphylococcus aureus* was done by standard conventional microbiological methods. These are identified by conducting catalase test, slide and tube coagulase test, mannitol fermentation test.

Antibiotic susceptibility testing was done by using Kirby Baur disk diffusion method as per CLSI (2014) guidelines. The antibiotics were selected according to the clinical samples and recommended by CLSI Oxacillin (1µg), Cefoxitin (30µg), Erythromycin (15µg), Clindamycin (2µg), Azithromycin (15µg), Penicillin G (10 units), Ciprofloxacin (5µg), Chloramphenicol (30µg), Tetracycline (30µg), and Linezolid (30µg). Methicillin-resistance was determined using the Cefoxitin and Oxacillin susceptibility. *S. aureus* ATCC 25923 was used for quality control of Kirby Bauer disc diffusion method. *S. aureus* ATCC 25923 and *S. aureus* ATCC 43300 were used for quality control of the methods for detection of methicillin resistance.

RESULTS

Total 85 *Staphylococcus aureus* were identified and antibiogram of them was studied. The isolates were found predominantly from the clinical samples of male of age group 15-65 years compared to female (Table 1).

Table 1: Age wise distribution of the patients.

Age groups of the patient (yrs.)	Male(%)	Female (%)	Total
0-5	6(75)	2(25)	8
6-14	4(50)	4(50)	8
15-65 and above	42(61)	27(39)	69
Total	52(61)	33(39)	85

Amongst all isolates of *Staphylococcus aureus* 45 (46%) isolates were from pus samples, amongst which 14 (31%)

were MRSA and 31 (69%) were MSSA. Pus sample was followed by urine sample from which 23 (48%) isolates were Methicillin resistant. 15 isolates were from blood amongst which 5 were MRSA. Two isolates were from fluid and both were MSSA (Table 2).

Table 2. Sample wise distribution of *staphylococcus aureus* with methicillin susceptibility.

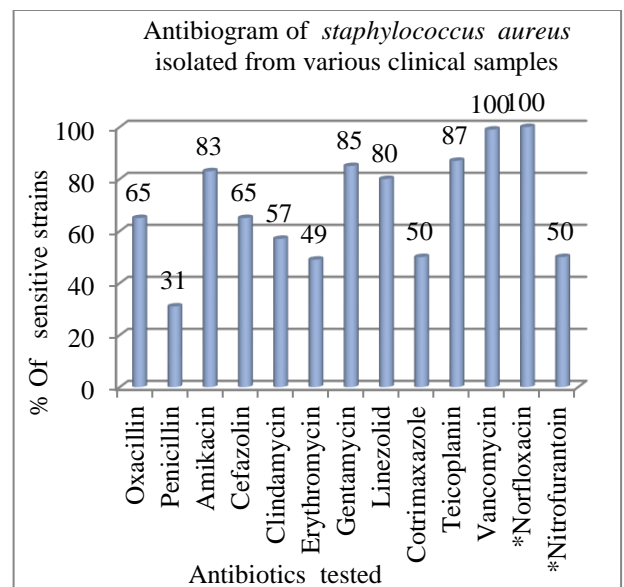
Specimen	Total	MRSA	% MRSA	MSSA	% MSSA
Pus	45	14	31	31	69
Urine	23	11	48	12	17
Blood	15	5	33	10	21
Fluid	2	0	0	2	100
Total	85	30	35	55	65

Table 3: Sensitivity pattern of *staphylococcus aureus*

Antibiotics tested	Sensitivity n=85 (%)
Teicoplanin	72(87)
Vancomycin	85(100)
Gentamycin	70(85)
Amikacin	68(83)
Linezolid	65(80)
Oxacillin	54(65)
Cefazolin	54(65)
Clindamycin	42(57)
Cotrimoxazole	35(50)
Erythromycin	34(49)
Penicillin	16(31)
*Norfloxacin	85(100)
*Nitrofurantoin	35(50)

*Tested only for Urine isolates

Antibiogram of *Staphylococcus aureus* isolates was studied. Amongst total clinical isolates 30 (35%) were MRSA (Methicillin resistant *Staphylococcus aureus*) & 54 (65%) MSSA (Methicillin sensitive *Staphylococcus aureus*).



*Tested only for Urine isolates

Figure 1: Sensitivity pattern of *Staphylococcus aureus*.

Similar results were observed for cefoxitin. Amongst Urine samples antibiotic susceptibility testing showed highest sensitivity against Vancomycin (100%), all the isolates were sensitive to Vancomycin. It was followed by Teicoplanin (87%) followed by Linezolid (80%) The sensitivity against Gentamycin, Amikacin, and Cotrimoxazole was 85%, 83%, 50% respectively. (Table 3, Figure 1).

57% strain was sensitive to Clindamycin and 49% were sensitive to Erythromycin. Inducible Clindamycin resistance by D test was not performed. Norfloxacin and Nitrofurantoin were tested for urine isolates and all the isolates of urine were sensitive to Norfloxacin and while 50% were sensitive to Nitrofurantoin. 26 (31%) isolates showed susceptibility to all antibiotics.

DISCUSSION

The Staphylococci associated with infections in humans are colonizers of various skin and mucosal surfaces.¹ It is also one of the most common pathogens that cause pyogenic skin infections. But it progresses in various severe types of infections like tissue infections, pneumonia, wound, joint, and/or bone infections.³⁻⁶ Drug resistance is so common among Staphylococci, the appropriate antibiotic should be chosen on the basis of antibiotic sensitivity.⁷

The present study observed *Staphylococcus aureus* isolated from male patients of age group 15 to 65 years. Hemmalini et al 2015 reported highest isolation in 0-10 yrs. of male patients.⁸ It is not till clear the relationship between the sex and the infection of *S. aureus*. The variations are observed in the percentage of *S. aureus*. Isolation varied from males to females in different studies.^{4,9,10} Wounds and abscesses were considered to be the mostly caused by *S. aureus*. Similar observation was reveled in the present study. Amongst the isolated strains of *Staphylococcus aureus*, 65% isolates were Methicillin sensitive and 35% isolates were resistant. Similar observation was found in the study by Rajaduraiipandi et al.⁹ Variation in rate of isolation of MRSA was seen.^{11,12} Comparatively in our study MRSA, resistance rate is found less it may be due to difference in the drug pressure in different communities. Yadav et al observed maximum MRSA isolates from urine, body fluids and pus sample.¹¹ From urine sample, 48% were found resistant to Methicillin followed by blood (35%). Amongst the pus equal amount of MRSA and MSSA were found. In the study, by Al-Zoubi et al. pus was common specimens with MRSA infections (71.05%), while blood was the least with 5.3%.⁶ All 100% isolates of *S. aureus* were found sensitive to Vancomycin. In present study Vancomycin sensitivity was also reported by disc diffusion method but according to newer CLSI

guidelines Vancomycin susceptibility should be reported by Minimum inhibitory concentration (MIC) only.¹³ Hence, Vancomycin is followed by Teicoplanin & Linezolid making them the drug of choice for most of the isolates isolated in this center. Similar observations were also found in a study by Forbes & Rajaduraiipandi.^{3,8,14} Susceptibility found for Erythromycin & Cotrimoxazole was 51% and 50% respectively. Penicillin G was resistant in 69% cases, hence cannot be used for these infections. Erythromycin and clindamycin susceptibility was found 34%, 40% respectively. Inducible clindamycin by clindamycin was not performed which are also the good options for treatment of Beta lactam antibiotic resistant isolates and Penicillin sensitive patients.

CONCLUSION

Present study shows that the *Staphylococcus aureus* is one of the important pathogen isolated from most of the clinical specimens like pus, urine, Blood and fluid. All the isolates were sensitive to Vancomycin and Linezolid hence remains the drug of choice for MRSA. *Staphylococcus aureus* had also shown multidrug resistance pattern. Hence, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance pattern. This will be beneficial to preserve the effectiveness of antibiotics and for better patient management.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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