Research Article

Prevalence and antimicrobial susceptibility pattern of methicillin resistant staphylococcus aureus in central India

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Abstract

Introduction: Methicillin resistant *Staphylococcus aureus* (MRSA) is an important nosocomial pathogen. The study reports the prevalence and antibiotic susceptibility pattern of MRSA in central india. **Material and Methods:** A total of 1690 clinical specimens were collected from different centers and subjected to MRSA screening using conventional microbiological methods. Subsequently the antibiotic sensitivity test was performed for the confirmed MRSA isolates. **Results:** Out of 210 strains of S. aureus isolated from clinical samples, 70 (33.33%) were found to be methicillin resistant respectively. Amongst all MRSA, 70 (100%) were resistant to penicillin, oxacillin, and gentamicin followed by amikacin (71.42%) and erythromycin(57.14%). MRSA also showed resistance to netillin, cotrimoxazole in 25.71% and 21.42% respectively. 14.28% resistance was also shown to chloramphenicol, ciprofloxacin and tetracycline, whereas all strains were sensitive to teicoplanin,vancomycin and linezolid. **Conclusion:** Routine screening of MRSA should be carried out by clinical microbiology laboratories because of the ability of these pathogens to acquire resistance to new classes of antimicrobial agents. Hence, surveillance on the antimicrobial susceptibility patterns is of utmost importance in understanding new and emerging resistance trends.
Keywords: MRSA.

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INTRODUCTION

The genus *Staphylococcus* includes pathogenic organisms in which *Staphylococcus aureus* is most important. It has overcome most of the therapeutic agents that have been developed in the recent years and hence the antimicrobial chemotherapy for this species has always been empirical.[1] The most notable example of this phenomenon was the emergence of methicillin resistant S *taphylococcus aureus* (MRSA), which was reported just one year after the launch of methicillin.[2] Many of these MRSA isolates are becoming multidrug resistant and are susceptible only to glycopeptide antibiotics such as vancomycin.[3] Low level resistance even to vancomycin is emerging at present.[4] The prolonged hospital stay, indiscriminate use of antibiotics, lack of awareness, receipt of antibiotics before coming to the hospital etc. are the possible predisposing factors of MRSA emergence.[5] Serious endemic and epidemic MRSA infections occur globally as infected and colonized patients in hospitals mediate the dissemination of these isolates and hospital staff assists further transmission.[6] The development of resistance to multiple antibiotics and control of disease transmission by MRSA isolates in hospitals/communities have been recognized as the major challenges.[2] 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 study determines the prevalence of MRSA from different clinical samples and their *in vitro* susceptibility pattern to various antimicrobial agents in central india..

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MATERIAL AND METHODS

A total of 210 *Staphylococcus aureus* isolates from routine clinical specimens submitted at the Shivira microbiology laboratory from January 2013 to December 2013 were included in this study. All isolates were identified morphologically and biochemically by standard laboratory procedures. [2] All the confirmed *S. aureus* strains were subsequently tested for methicillin resistance based on Kirby-Bauer disk diffusion method using cefoxitin discs (30µg) obtained from Hi-Media Laboratories Pvt. Ltd. The isolates were considered methicillin resistant if the zone of inhibition was 21 mm or less. Further, the antibiotic susceptibility pattern of methicillin resistant *S. aureus* strains was determined by the Kirby Bauer disc diffusion method on Muller Hinton agar to different antimicrobials. The antibiotics used were penicillin-G (10 unit); oxacillin (1 µg); erythromycin (15µg); clindamycin(2µg); gentamicin (10µg); amikacin (30µg); netillin (30µg); ciprofloxacin (5µg); co-trimoxazole (25µg);chloramphenicol (30µg); tetracycline (30µg); nitrofurantoin (300 µg);teicoplanin (30µg);linezolid (30µg). Minimum inhibitory concentration of Vancomycin was determined. Disk Diffusion and MIC interpretive criteria were taken into consideration according to CLSI guidelines. Finally, the data were recorded and analyzed as per recommendations of the CLSI. *S. aureus* ATCC 25923 as sensitive and ATCC 43300 as resistant strain were used for standard control.

RESULTS

Table 1: Number and Percentage Distribution of MRSA from Different Clinical Specimens

Clinical Specimens	Total Specimens (n=1690)	S.aureus (n=210)	Percentage (%)	MRSA (n=70)	Percentage (%)
Pus/Wound swab	540	152	28.14	55	36.18
Sputum/Throat swab	225	15	06.66	05	33.33
Blood	241	21	08.71	07	33.33
Urine	455	07	01.53	01	14.28
Fluids(Pleural/Synovial)	229	15	06.55	02	13.33
Total	1690	210	12.42	70	33.33

Table 2: Drug resistance pattern of MRSA isolated from clinical specimens (n=70)

Antibiotic	Drug Resistance	Percentage
Amikacin	50	71.42
Chloramphenicol	10	14.28
Ciprofloxacin	10	14.28
Clindamycin	03	04.28
Cotrimoxazole	15	21.42
Erythromycin	40	57.14
Gentamicin	70	100.00
Linezolid	00	00.00
Netillin	18	25.71
Nitrofurantoin	10	14.28
Oxacillin	70	100.00
Penicillin	70	100.00
Tetracycline	10	14.28
Teicoplanin	00	00.00
Vancomycin (By E-Test)	00	00.00

A total of 210 *S. aureus* strains were isolated from various clinical specimens. Of 210 isolates, 70 (33.33%) were found to be methicillin-resistant. Maximum isolation of MRSA was from pus/wound swabs (36.18%) followed by sputum/throat swab and blood respectively (33.33%). (Table 1). Table 2 depicts drug resistance pattern of MRSA isolated from clinical specimens. Amongst all MRSA, 70 (100%) were resistant to penicillin, oxacillin, and gentamicin followed by amikacin (71.42%) and erythromycin (57.14%). MRSA also showed resistance to netillin, cotrimoxazole in 25.71% and 21.42% respectively. 14.28% resistance was also shown to chloramphenicol, ciprofloxacin and tetracycline,whereas all strains were sensitive to teicoplanin,vancomycin and linezolid. (Table 2).

DISCUSSION

MRSA is a global phenomenon with a prevalence rate ranging from 2% in the Netherlands and Switzerland, to 70% in Japan and Hong Kong.[7,8] In this study, the prevalence of MRSA was found to be 33.33%. A comparable prevalence rate of 31% and 38.56% were also

reported from Tamil Nadu and Delhi, whereas in some studies the rate is comparatively low (19.56% in Nagpur) and in another study it was very high (80.89% in Indore).[9,10,11,12] In this study as high as 36.18% of MRSA strains were obtained from pus/wound swabs followed by sputum/throat swab and blood (i.e 33.33% each).Similar observation was made by Mehta et al,[13] who had reported a high isolation rate of up to 33% from pus and wound swab. Similarly a study done by Ringerberg H et al[14] reported 33% isolation of MRSA from throat samples and concluded that throat is an important reservoir for MRSA and that samples taken from the throat should be included in screening patients for MRSA. Among 70 MRSA isolates, 100% resistant were shown to penicillin, oxacillin and gentamicin, 71.42% were resistant to amikacin, 57.14% erythromycin, 25.71% netillin, 21.42% cotrimoxazole, 14.28% each to chloramphenicol, ciprofloxacin, nitrofurantoin and tetracycline, while 4.28% to clindamycin.In this study all MRSA strains were sensitive to teicoplanin, vancomycin and linezolid (i.e 100%). Although MRSA from clinical specimens showed higher susceptibility to individual antibiotics when compared with others, we obtained high percentage of multidrug resistant MRSA from these specimens. Majumder[15] from Assam had reported 23.2% of the MRSA isolated from clinical specimens to be multidrug resistant. Anupurba[16] from Uttarpradesh had reported a higher percentage of multidrug resistant MRSA. Vidhani[17] from Delhi reported even a higher percentage of multidrug MRSA but from high risk patients admitted in burns and orthopedic units. De-escalation of vancomycin to β-lactams should be encouraged in all cases of MSSA. With MRSA isolates being widespread, it is imperative that treating physicians de-escalate to β-lactams once the culture sensitivity results reveal a MSSA isolate. Preservation of glycopeptides and linezolid for use only in MRSA cases should be encouraged.[18]

CONCLUSION

Routine screening of MRSA should be carried out by clinical microbiology laboratories because of the ability of these pathogens to acquire resistance to new classes of antimicrobial agents. Hence, surveillance on the antimicrobial susceptibility patterns is of utmost importance in understanding new and emerging resistance trends.

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