

Original Article

Antimicrobial susceptibility pattern of Methicillin Resistant Staphylococcus Aureus isolated from various clinical samples at SSG hospital, Baroda

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ABSTRACT

Background: Methicillin resistant Staphylococcus aureus (MRSA) is an important nosocomial pathogen causing significant mortality and morbidity. It is associated with a wide spectrum of infections ranging from mild skin and soft tissue infections to life threatening sepsis. Infected and colonized patients are the main reservoirs of infection and hand carriage by health care workers is the predominant mode of transmission.

Aim: This study was undertaken to determine the prevalence of MRSA and their susceptibility pattern at SSG hospital, Baroda.

Materials and Methods: 150 isolates of Staphylococcus aureus were obtained from different clinical specimens from hospitalized patients. They were screened for methicillin resistance by standard laboratory procedures. Susceptibility to beta lactams, aminoglycosides, macrolides, fluoroquinolones, glycopeptides and Oxazolidinones were determined by disc diffusion method.

Results: Among the 150 Staphylococcus aureus isolates studied, 65 (43.3%) were MRSA. Among the 65 MRSA isolates are 96.93% susceptible to Vancomycin, 100% susceptible to Linezolid and 35.39% susceptible to Gentamicin, 12.31% susceptible to Azithromycin; 32.31% susceptible to Clindamycin and 00% susceptible to penicillin, oxacillin & ceftazidime.

Conclusion: The MRSA isolates were associated with a high degree of co-resistance to other groups of antimicrobial agents. Active screening and compliance with recommended infection control practices play an important role in the control of MRSA.

Key words: MRSA, Antimicrobial tests, infection control

INTRODUCTION

Staphylococcus aureus is one of the most common pathogens causing a variety of infections ranging from relatively benign skin infection to life threatening systemic illness such as pneumonia, endocarditic septic arthritis, subcutaneous or visceral abscesses [1].

Before the introduction of penicillin in the late 1940s, Staphylococcal septicemia was associated with an extremely high mortality rate. Penicillin dramatically improved the prognosis of this infection [2]. However, penicillin resistant strains were discovered shortly and penicillin became ineffective both in the hospital and community settings [3, 4]. The development of beta-

lactamase penicillins such as methicillin and oxacillin in the early 1960s once again revolutionized the treatment of Staphylococcal infections. Within a year of the use of methicillin, methicillin resistant Staphylococcus aureus (MRSA) strains were reported worldwide and over the next few decades, MRSA has reached epidemic proportions [5, 6].

MRSA is a resistant variant of Staphylococcus aureus which has evolved an ability to survive treatment with beta antibiotics which includes penicillin, methicillin, cephalosporins and to various other groups of antimicrobial agents. Most isolates remain susceptible to Glycopeptides (Vancomycin, Teicoplanin), Oxazolidinones (linezolid), Streptogramins (quinupristin-dalfopristin), and polycyclic compounds

(tetracycline, tigecycline) [7, 8].

MRSA is well recognized now as a major cause of nosocomial infections worldwide and these infections impose a high burden on health care resources [9]. A significant concern now is the spreading of MRSA in the community, possibly because of antibiotic pressure outside the hospital and transfer from hospital settings. Community acquired MRSA (CA-MRSA) strains differ from health care associated MRSA (HA-MRSA) in that they are more frequently recovered from skin and soft tissue infections and also cause severe pneumonia in otherwise healthy patients [10, 11].

Accurate and rapid identification of MRSA and their antimicrobial susceptibility profile is therefore necessary for the selection of appropriate therapy [12]. This study was carried out to determine the prevalence of MRSA and their susceptibility pattern to various antimicrobial agents.

MATERIALS AND METHODS

Study duration and Sample size

This prospective study was conducted from April 2014 to June 2014 at S.S.G. Hospital, Baroda. During this period total 3140 samples (blood, wound pus, sputum, various body fluids, urine) were tested, of which 1820 samples showed growth. Out of 1820, 150 Staph. aureus isolated from various clinical samples were tested for MRSA.

Ethical clearance

All these samples were a part of diagnosis. So ethical consideration is not necessary.

Methods for isolation and identification of Staph. aureus

The samples were selected on the basis of their growth on routine Nutrient agar (golden yellow pigmented colonies) which was catalase test, coagulase test & mannitol salt agar test positive & all confirmatory test positive for Staph. aureus.

The Staphylococcus aureus isolates were subjected to susceptibility testing by disc diffusion technique according to the Clinical Laboratory Standards International (CLSI) guidelines with quality controls (Staphylococcus aureus ATCC 29213) [13].

Screen test for MRSA

Methicillin resistance was screened by disc diffusion method using 30µg cefoxitin disk .The diameter of the

zone of inhibition was measured and interpretation was done in accordance with the CLSI guidelines. An isolate was considered to be a MRSA strain if cefoxitin inhibition zone diameter was < 21 mm on 4% NaCl Mueller Hinton Agar by using the Kirby Bauer's disc diffusion technique [13].

Susceptibility test for MRSA

The antimicrobials tested included penicillin G (10µg), cefoxitin (30 µg), oxacillin (30µg), gentamycin (10µg), azithromycin (30µg), clindamycin (30µg), vancomycin (30µg) and linezolid (30µg).

Out of the 150 Staphylococcus aureus isolates 65 (43.3%) exhibited < 21 mm zone of inhibition to cefoxitin (30µg). They were also resistant to oxacillin. They were considered as MRSA. All the MRSA were susceptible to vancomycin and linezolid except 2 samples are resistant to vancomycin.

RESULTS

Total 3140 samples (blood, wound pus, sputum, various body fluids, urine) were tested, of which 1820 samples showed growth. Out of 1820, 150 Staph. aureus isolated from various clinical samples were tested for MRSA. Out of 150 Staph. aureus isolated, 65 were MRSA. Prevalence of MRSA was 3% as shown in table-1.

Table 1: Prevalence of MRSA

Total Staph. aureus	MRSA (%)
150	65 (43.33%)

Table-2 shows the distribution of MRSA among the various clinical specimens. Most numbers of MRSA isolates were from wound swabs (53.84%) followed by blood (23.07%), pus (10.76%), tracheal secretion (6.15%), urine (3.07%) and sputum (1.53%).

Table 2: MRSA from different clinical specimens

Samples	MRSA (n=65)
Blood	15 (23.07%)
Wound	35 (53.84%)
Pus	07 (10.76%)
Tracheal secretion	04 (6.15%)
Urine	02 (3.07%)
Discharge	01 (1.53%)
Sputum	01 (1.53%)
Pleural fluid	00 (0%)
Total	65

Among the 65 MRSA isolates are 96.93% susceptible to Vancomycin, 100% susceptible to Linezolid, 35.39% susceptible to Gentamicin, 12.31% susceptible to Azithromycin, 32.31% susceptible to clindamycin and 00% susceptible to penicillin, oxacillin & ceftioxin as shown in table-3.

Table 3: Antibiotic susceptibility pattern of MRSA

Antibiotic Drug	% Susceptibility in MRSA (N=65)
Penicillin G	00%
Oxacillin	00%
Ceftioxin	00%
Vancomycin	96.93%
Linezolid	100%
Gentamicin	35.39%
Azithromycin	12.31%
Clindamycin	32.31%

DISCUSSION

MRSA is a major cause of nosocomial infections worldwide. Serious endemic and epidemic MRSA infections occur globally as infected and colonized patients in the health care settings are the reservoirs.

The prevalence of MRSA in this study was 43.33%. This study was comparable to INSAR (Indian Network for Surveillance of Antimicrobial Resistance) group, India, which shows prevalence of MRSA was 41% in the year of 2008-2009 [14].

In this study majority of the MRSA isolates were more from exudative specimens of wound swabs (53.84%) followed by blood (23.07%), pus (10.76%), tracheal secretion (6.15%), urine (3.07%), sputum (1.53%) which is in accordance to the study of Lahari et al in 2008 in Assam in which maximum isolation of MRSA was from pus/wound swabs (46.67%) [15].

Antibiotic susceptibility testing data for Penicillin G, Oxacillin, Ceftioxin, Azithromycin, clindamycin, Gentamicin, Vancomycin and Linezolid were compiled. Majority of MRSA isolates were susceptible to Vancomycin and Linezolid and resistant to Penicillin G, Oxacillin, Ceftioxin. So, Glycopeptides and Linezolid continue to remain the mainstay for treatment for MRSA infections. Similar sensitivity pattern was also identified in study of Vidya Pai et al [16].

The limitations of this study are that, the isolates obtained after admission in hospital were included in the study. This could possibly include some strains the patients had acquired before admission. Clinical history was obtained for all the isolates to ascertain its clinical significance.

CONCLUSION

The prevalence of MRSA is 43.3% among clinical isolates of *Staphylococcus aureus*. Active screening and compliance with recommended infection control practices play an important role in the control of MRSA. Attention should be paid to halt the transmission of MRSA by health care workers by meticulous hand washing.

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