Prevalence and Antimicrobial Susceptibility Pattern of 
Staphylococcus aureus Isolates at Shahidbeheshti Hospital

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Abstract: Resistance strains of *S. aureus* become a new challenge in treatment of infections. Methicillin Resistant *S. aureus* (MRSA) have become very common and if a MRSA outbreak happens, it would be difficult to control. Evaluating the rate of MRSA and its resistance pattern can be used to formulate antibiotic policy and appropriate control measures. This study was conducted on 503 *S. aureus* isolates obtained from different origins (2010-2012) in Shahidbeheshti hospital of Kashan. 38.5% of *S. aureus* samples were MRSA and 75.9% of *S. aureus* samples were from blood. The rate of MRSA is high in Shahidbeheshti hospital. Resistance rates of MRSA isolates are twice as high as all strains and shows multidrug resistance nature of MRSA. But a lot of antibiotics can still be used after sensitivity test and we should not harsh to use vancomycin because *S. aureus* will produce resistance strains soon.

Key words: Staphylococcus aureus • Methicillin-Resistant Staphylococcus aureus • Vancomycin Resistance

INTRODUCTION

*Staphylococcus aureus* (*S. aureus*) is one of the most prevalent and challenging cause of infection [1]. It may lead to serious complications as pneumonia, septicemia and arthritis [2]. The wide use of antibiotics in treatment of infections lead to antibiotic resistance among different bacterial strains [3, 4] and resistance strains of *S. aureus* have been produced and became a new challenge in treatment of infections [5, 6]. It may cause mortality, morbidity, elevated health care costs and longer hospital admission duration [7]. Methicillin Resistant *S. aureus* (MRSA) have different degrees of resistance to a wide range of antibiotics other than beta-lactam antibiotics [8]. Increasing prevalence of MRSA may result from increasing use of wide spectrum antibiotics in treatment of *S. aureus* infections in hospital and transmitting these resistant strains to community [9]. By emerging Vancomycin Intermediate Resistant *S. aureus* and Vancomycin Resistant *S. aureus* (VRSA), in 1997 a threat to hospitals, especially those with ICU units which handle serious patients, have been felt because Vancomycin is the last line of treatment in such cases [10]. There are several reporting of MRSA outbreaks [11]. MRSA has become very common and if a MRSA outbreak happens, it would be difficult to control. Healthcare staff become reservoir for MRSA and helps to further spread of this pathogen [12]. Mortality rate of MRSA is twice MSSA. The fact of unavailability of sensitive antibiotics made pharmaceutical manufacturers to try their best in producing new generations of sensitive antibiotics for treating MRSA.

Previous reports showed a high antibiotic resistance rate among Gram-negative bacteria isolates of samples of patients admitted to Shahidbeheshti hospital [13]. The present study has been carried out in Shahidbeheshti, a medical college hospital with an aim to know the prevalence and antibiotic sensitivity pattern of *Staphylococcus aureus* isolates, in order to utilize the information obtained and formulate antibiotic policy and appropriate control measures.
MATERIALS AND METHODS

The study conducted on 503 S. aureus isolates that obtained from different origins (wound, blood, urine, respiratory fluids and sputum) from January 2010 to September 2012 in Shahidbeheshti hospital of Kashan. The samples were cultured on blood agar and MacConkey agar plates and incubated aerobically at 37°C for 48 hours. Standard tests like catalase, slide and tube coagulase and growth on mannitol salt agar were used to identify the strains [12]. Antimicrobial susceptibility was evaluated by the Kirby-Bauer disk diffusion method in guide lines of Clinical and Laboratory Standards Institute [14]. Disk diffusion method was used for the following antibiotics: erythromycin (15 µg), ciprofloxacin (5 µg), chloramphenicol (30 µg), amikacin (30 µg), clindamycin (2 µg), rifampicin (5 µg), penicillin (10 units) and vancomycin (30 µg). Test for methicillin resistance was performed by Kirby–Bauer disc diffusion method using oxacillin (1 µg) disc on Mueller–Hinton agar (HiMedia Labs, Mumbai) with 24 hours incubation at 35°C. Evaluation of the results was done based on the criteria of CLSI [15]. Methicillin resistance was confirmed by agar screen test using Mueller–Hinton agar plate supplemented with 4% NaCl and oxacillin (6 µg/ml). S. aureus NCTC 6571 was used as a control methicillin-sensitive strain and S. aureus NCTC 12493 as a control methicillin-resistant strain.

RESULTS

Total of 503 isolates were identified as S. aureus isolates. Three hundred eighty two, 382 (75.9%) of cases were from blood, 95 (18.9%) were from urine and 26 (5.2%) were from respiratory tract samples. One hundred ninety four, 194 (38.5) of 503S. aureus samples were MRSA. Three hundred eighty two, 382 (75.9%) of the isolates were from blood, 95 (18.9%) were from urine, 26 (51.7%) were from respiratory tract (Table 1). All the strains of MRSA were resistant to penicillin. But 14.6% of all strains (MRSA and MSSA) were sensitive to penicillin. All resistance rates of all 503 asS. aureus strains are shown in Table 2. Table 3 summarizes the resistance rate of MRSA strains to the tested antibiotics.

DISCUSSION

The prevalence of MRSA was 38.5% in our study. Some regions in Iran like Tehran have reported to have over 90% of MRSA rate in clinical isolates [16], but some regions reported lesser MRSA rate in Esfahan [17], (20.48%) and Gorgan [18] (35.13%). A review article conducted in 2012 reported 52.7%±4.7 of mean prevalence of MRSA in Iran and pointed out that MRSA prevalence is more than fifty percent in many Iranian cities [19].

The prevalence of MRSA in our study is in accordance with the prevalence of 32.8% of a study in India [20], but a study in Nepal reported 26.14% of MRSA in a study [21]. MRSA are usually proved to be mostly multidrug resistance [12]. In our study MRSA strains resistant rate are about twice as MSSA, except for penicillin, rifampin and vancomycin. Penicillin is mostly resistant in all strains of S. aureus regardless of being MRSA or MSSA. A study conducted in South Maharashtra reported that more than 90% of isolates are resistant to penicillin and erythromycin, whereas only 39.1% were resistant to methicillin [22]. These rates are in

<table>
<thead>
<tr>
<th>Origin</th>
<th>S. aureus</th>
<th>MRSA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood</td>
<td>382</td>
<td>152 (39.7)</td>
</tr>
<tr>
<td>Urine</td>
<td>95</td>
<td>32 (33.6)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>26</td>
<td>10 (38.4)</td>
</tr>
<tr>
<td>Total</td>
<td>503</td>
<td>194 (38.5)</td>
</tr>
</tbody>
</table>

Table 2: Resistance rate of all isolates

<table>
<thead>
<tr>
<th>Disc</th>
<th>Amikacin</th>
<th>Ciprofloxacin</th>
<th>Chloramphenicol</th>
<th>Erythromycin</th>
<th>Clindamycin</th>
<th>Rifampin</th>
<th>Vancomycin</th>
<th>Penicillin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive (%)</td>
<td>413(82.2)</td>
<td>397(78.9)</td>
<td>445(88.5)</td>
<td>289(57.5)</td>
<td>342(68)</td>
<td>490(97.5)</td>
<td>501(99.7)</td>
<td>73(14.6)</td>
</tr>
<tr>
<td>Resistance (%)</td>
<td>90(17.8)</td>
<td>106(21)</td>
<td>58(11.5)</td>
<td>214(42.5)</td>
<td>161(32)</td>
<td>13(2.5)</td>
<td>2(0.3)</td>
<td>430(85.4)</td>
</tr>
</tbody>
</table>

Table 3: Resistance rate of MRSA isolates

<table>
<thead>
<tr>
<th>Disc</th>
<th>Amikacin</th>
<th>Ciprofloxacin</th>
<th>Chloramphenicol</th>
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<th>Clindamycin</th>
<th>Rifampin</th>
<th>Vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive (%)</td>
<td>132(68)</td>
<td>119(61.3)</td>
<td>149(76.8)</td>
<td>44(22.6)</td>
<td>101(52)</td>
<td>185(95.4)</td>
<td>192(99)</td>
</tr>
<tr>
<td>Resistance (%)</td>
<td>62(32)</td>
<td>75(38.7)</td>
<td>45(23.2)</td>
<td>150(77.3)</td>
<td>93(48)</td>
<td>9(4.6)</td>
<td>2(1)</td>
</tr>
</tbody>
</table>
accordance with our results, except for erythromycin resistance rate that is much lower in our study. This may be due to less consumption of the named antibiotic in hospitals of Kashan.

Antibiotics such as Amikacin, ciprofloxacin, chloramphenicol, Clindamycin and Rifampin can be easily used for patients who have sensitivity test confirmation of MSSA. Reserving Vancomycin for patients of MRSA and resistant to other antibiotics seems to be reasonable.

The rate of Vancomycin Resistance S. aureus (VRSA) was 0.3% in all S. aureus strains and 1% in MRSA isolates. The antibiotic resistance of the VRSA isolates showed that they were resistant to all the discs used. The first clinical vancomycin-resistance S. aureus was reported in 2002 in USA [23]. In Iran the first VRSA was detected in 2007 [24]. Emerging VRSA strains should be considered important because this antibiotic is one of the last line therapies that is effective on many infections.

**CONCLUSION**

The rate of MRSA is high in Shahidbeheshti hospital. Resistance rates of MRSA isolates are twice as high as all strains and shows multidrug resistance nature of MRSA. But a lot of antibiotics can still be used after sensitivity test and we should not harsh to use vancomycin because S. aureus will produce resistance strains soon.

**REFERENCES**


