FREQUENCY AND RESISTANCE PATTERNS OF METHICILLIN- SENSITIVE AND METHICILLIN- RESISTANT STAPHYLOCOCCUS AUREUS IN PNS SHIFA HOSPITAL KARACHI, PAKISTAN

Sabahat Saeed¹ and Sumaira Kiran¹,²

¹Department of Microbiology, Jinnah University for Women, Karachi, Pakistan.
²Diagnostic Lab of Clinical Microbiology, PNS Shifa Hospital, Karachi Pakistan.
sabahatsaeed2003@yahoo.com

ABSTRACT

An increase in resistance of Staphylococcus aureus to antibiotics; especially methicillin, vancomycin and linezolid; is a growing concern limiting the treatment modalities. The current study was conducted to find out the frequency and antibiotic resistant pattern of methicillin-sensitive and resistant S. aureus. All the clinical samples received at Diagnostic Microbiological Laboratory PNS Shifa Hospital Karachi were processed. Staphylococci were identified by standard procedures. Methicillin-resistant S. aureus (MRSA) isolates were identified by a slide latex agglutination kit for the detection of penicillin binding protein 2 (PBP 2). Two hundred and fifty six Staphylococcus isolates were recovered from different samples of blood, pus, urine, ear swab, sputum, ascetic fluid, throat swab and pleural fluid. One hundred and forty eight (60.2%) were coagulase positive. Of these, 32 (21.8%) were found to be coagulase negative S. aureus (PNS Shifa). The mechanism of transmission is through contaminated hands of health care personals (Brown et al., 2005). MRSA is now recognized as an important pathogen causing community and hospital acquired infections (Ajmal et al., 2009). MRSA is also called as oxicillin-resistant S. aureus (ORSA) (Siddiqi et al., 2009). During recent years, infections caused by MRSA have increased rapidly though out the world (Akhtar et al., 2009). This increasing resistant has become a cause of treatment failure (Mehdinejad et al., 2008). Certain risk factors are associated with colonization and infections caused by MRSA include prolong hospitalization particularly in intensive care unit (ICUs), intravascular catheterization, excessive and unnecessary use of antibiotics and immuno-compromised health status of individual (Ajmal et al., 2009). Carriers and infected individuals serve as reservoirs of MRSA. Another important mode of transmission is through contaminated hands of health care personals (Brown et al., 2005).

In case S. aureus the mechanism of methicillin resistance is the production of an additional penicillin binding protein 2 (PBP 2), a product of ‘mec A’ gene. It is an additional gene present in MRSA and absent in MSSA. Several additional genes for methicillin resistance are also present in S. aureus but these are also present in methicillin sensitive strain of S. aureus (Rahbar et al., 2006). MRSA is widely distributed but the frequency varies with respect to time and place (Shabir et al., 2010). A small amount of data is available about the prevalence of MRSA in different cities of Pakistan. Research papers claimed around 35% MRSA in Pakistan (Hafiz et al., 2002). The current study was performed to find out the frequency of MRSA in Karachi, Pakistan. In addition, the
comparison of antibiotics resistance pattern were also determined among methicillin-sensitive and methicillin-resistant S. aureus.

MATERIALS AND METHODS

The study was carried out in PNS Shifa Hospital Karachi, Pakistan from July, 2011 to October 2011. All samples of blood, pus, urine, ear swab, sputum, ascetic fluids, throat swab and pleural fluid, received at diagnostic Microbiological Laboratory, PNS Shifa Hospital, were processed. Identification of staphylococci was performed by colonial and morphological characteristics, Gram staining, catalase test, coagulase test and mannitol fermentation.

Screening for MRSA was performed, the detection of PBP 2, by slide latex agglutination kit. Antibiotic resistance was carried out by standard Kirby Bauer disc diffusion method against vancomycin, rifampicin, gentamicin, clindamycin, cefoxitin, ciprofloxacin, penicillin, erythromycin, doxycyclin, trimethoprimsulfamethoxazole, amikacin, tigecycline, linezolid, ofloxacin and fusidic acid. Mueller-Hinton agar (Oxoid) was used as base medium. The inoculated plates were incubated at 37 °C for 18-24 hours. The inhibition zone diameters were measured in millimeter and were interpreted on the basis of guidelines published by the NCCLS.

RESULTS AND DISCUSSION

A total of 246 Staphylococcus species were isolated, out of which 148 (60.2%) were S. aureus. Out of these 148 S. aureus 32 (21.8%) were found methicillin-resistant (Table 1). Coexisting resistance to different antibiotics used in the present study with methicillin was found to be significantly higher as compare to MSSA (Table 2).

In Pakistan, the problem of emergence of antibiotic resistance has increased due to the injudicious use of antibiotics in hospital settings, easy availability of antibiotics without prescriptions as well as lack of public awareness (Mulla et al., 2007). The current study highlights the problem of MRSA in Pakistan. In present study the frequency of MRSA noted as 21.8%. These findings are in fair correlation with a study who reported 22.9% frequency of MRSA in Karachi (Akhtar et al., 2009). Many investigators have also reported the frequency of MRSA in Karachi during last ten years. However, our findings are less than that reported in other studies from Karachi 57% (Hafiz et al., 2002), 24.39% (Naqvi et al., 2007), 43% (Perwaiz et al., 2007), 48.24% (Ansari et al., 2011). Many studies have also been carried out on growing interest over methicillin resistance in S. aureus in other cities of Pakistan i.e. In Lahore 61% (Hafiz et al., 2002), 63.64% (Ifiat et al., 2002), 38.5% (Khatoon et al., 2002), 38.5% (Bukhari et al., 2004), 27.77% (Ajmal et al., 2009), 34.76% (Siddiqi et al., 2009), in Islamabad 46%, Peshawar 36%, Sukkhar 26% and Azad Kashmir 32% (Hafiz et al., 2002), in Sargodha 22.3% (Siddiqi et al., 1999), in Rawalpindi 42.01% (Ali et al., 2007), in Gujranwala 68% (Ahmed et al., 2007) and in Quetta 5.01% (Qureshi et al. 2000) and 26% (Hafiz et al., 2002).

Table 1. Distribution of Staphylococcus species with respect to different clinical samples.

<table>
<thead>
<tr>
<th>Clinical Sample</th>
<th>Coagulase negative Staphylococci</th>
<th>Coagulase positive S. aureus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MSSA</td>
<td>MRSA</td>
</tr>
<tr>
<td>Blood</td>
<td>77</td>
<td>27</td>
<td>05</td>
</tr>
<tr>
<td>Pus</td>
<td>16</td>
<td>84</td>
<td>21</td>
</tr>
<tr>
<td>Urine</td>
<td>02</td>
<td>02</td>
<td>01</td>
</tr>
<tr>
<td>Ear swab</td>
<td>01</td>
<td>0</td>
<td>02</td>
</tr>
<tr>
<td>Sputum</td>
<td>01</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ascitic fluid</td>
<td>01</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>Throat swab</td>
<td>0</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Pleural fluid</td>
<td>0</td>
<td>01</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>98/246</td>
<td>116/148</td>
<td>32/148</td>
</tr>
<tr>
<td></td>
<td>(39.8%)</td>
<td>(78.4%)</td>
<td>(21.8%)</td>
</tr>
</tbody>
</table>
In present study, low rate of resistance was noted in MSSA as compared to MRSA. The highest resistance was seen against penicillin i.e. 81.25% in MRSA and 75% in MSSA. Our findings are in correlation with other studies who reported 100% resistance in MRSA and 81% in MSSA (Perwaiz et al., 2007), while 100% in MRSA and 73.13% in MSSA (Akhtar et al., 2009). Low level of resistance to vancomycin, rifampicin and linezolid (6.25% in MRSA and 0% in MSSA for each of these antibiotics) was reported. The result are not in agreement with other studies conducted in Pakistan in which MRSA and MSSA both were found 100% sensitive to vancomycin (Latif et al., 2000; Naqvi et al., 2007; Perwaiz et al., 2007; Akhtar et al., 2009; Kaleem et al., 2010). However, the data about the resistance pattern of S. aureus against rifampicin is lacking the literature.

It is apparent that MRSA is emerging as a potential threat to the hospitals. Current study showed varying degree of resistance to all antibiotics tested both MRSA and MSSA. The study also revealed coexisting resistance to other antibiotics with methicillin. Timely detection of strains resistant to multiple antibiotics will help in the prevention of infections caused by multi-drug-resistant strains. Therefore, it is recommended that careful and continuous monitoring if resistance pattern of pathogenic microorganisms is necessary.

REFERENCES


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