EMERGING DRUG RESISTANT STREPTOCOCCAL ISOLATES FROM SKIN AND SOFT TISSUE INFECTIONS

Bhawna Sharma1, Rushika Sakseen2, Manisha Jain3, Rajni Gaind4

1Assistant Professor, Department of Microbiology, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India.
2Specialist, Department of Microbiology, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India.
3Assistant Professor, Department of Microbiology, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India.
4Senior Consultant and Professor, Department of Microbiology, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, India.

BACKGROUND

Streptococcal species are the cause of a variety of skin and soft tissue infections (SSTIs) some of which are severe and can be life-threatening. There are currently 74 species under the genus Streptococcus. Streptococcus pyogenes is the most pathogenic bacterium in the genus Streptococcus. We wanted to assess pyogenic potential of different species Streptococcus and their drug susceptibility patterns.

METHODS

This is a retrospective descriptive study done from Jan 2017 to Nov 2017. Total enrolled pus samples were 3300. The samples were processed conventionally and antibiotic sensitivity testing (AST) of all isolates was performed by Kirby Bauer’s disc diffusion method as per CLSI guidelines.

RESULTS

4.63 % were culture positive for streptococcal isolates. Among streptococcal isolates, 128/153 (83.66%) were Enterococcus species, 12/153 (7.84%) were Streptococcus pyogenes and 10/153 (6.53%) were Streptococcus agalactiae and 3/153 (1.96%) were Streptococcus pneumoniae. For all Streptococcal isolates (153), 64% (102/160) were male patients and 36% (58/160) were female patients. Drug resistance is increasing for all the streptococcal species, and resistance to even high-end drugs like vancomycin was seen to be around 7.5% in Enterococcus spp. Almost one third of the isolates of Streptococcus pyogenes were resistant to Erythromycin and Gentamicin. No resistance was seen to Linezolid in any of the Streptococcal isolates.

CONCLUSIONS

Streptococcal species such as S. pyogenes, S. agalactiae and Streptococcus pneumoniae are seen to be increasing in SSTIs. Bacterial isolates exhibited high to moderate levels of resistance against different classes of antibiotics. A continuous inspection should be carried out to monitor the susceptibility of these pathogens and choose appropriate regimens both for prophylaxis and treatment of surgical wound infections. There is a need to create a viable antibiotic policy and draft guidelines to prevent or reduce undirected use of antibiotics, and conserve their effectiveness for better patient management. Consistent dialogue between the microbiology department and the surgeons is required for management of such cases.

bloodstream and gastrointestinal infections. However, the increasing use of cephalosporins has contributed to emergence of Enterococci as etiological agents of SSTIs especially after trauma and surgery.12

The inadvertent use of antibiotics leading to emergence of drug resistant pathogens is a great healthcare challenge. Although Penicillin remains the drug of choice for Group A and Group B Streptococci, resistance to macrolides, lincosamides and fluoroquinolones has emerged.13 Similarly, incidence of difficult to treat Vancomycin resistant Enterococci (VRE) too is on the rise.14

Thus, the present study aimed to assess pyogenic potential of different species of Streptococcus and their drug susceptibility patterns from patients with pus and/or wound discharge.

METHODS

Study Design

This is a retrospective descriptive study conducted at the department of microbiology in a tertiary care hospital of northern India from January 2017 to November 2017.

Sampling Methods

Microbiology database was screened for all Streptococcal isolates from pus, wound discharge and tissue samples collected from patients with SSTIs. A total number of 3300 pus samples were obtained for aerobic culture and sensitivity testing from different In-patient department (IPD) & Outpatient department (OPD) of our hospital. Pus samples were collected with sterile disposable cotton swabs and aspirates in syringe and were transported and processed in the microbiology laboratory immediately.

Sample Processing

They were inoculated on to 5% sheep Blood agar (BA), MacConkey agar (MA) and Brain heart infusion broth. Direct microscopy was performed by gram stain examination of the samples. All available clinical details of patients were noted. Culture plates were incubated at 37°C for 24 to 48 hrs. under aerobic condition. After incubation, identification of bacteria from positive cultures was done using standard phenotypic methods. All Streptococcal isolates were confirmed by conventional and serological tests. The antibiotic sensitivity testing (AST) of all isolates was performed by disk diffusion method on Muller Hinton agar and interpreted as per CLSI guidelines and classified as sensitive and resistant (CLSI 2017).15 Antimicrobial susceptibility testing was performed against the following antibiotics: Ampicillin (30 μg), Gentamicin (10 μg and 120 μg), Cefoxitin (30 μg), Linezolid (30 μg), Vancomycin (30 μg), Ciprofloxacin (5 μg), Erythromycin (10 μg), Clindamycin (2 μg), Trimethoprim/Sulfamethoxazole (1.25 μg/23.75 μg), Escherichia coli ATCC 25922 and Staphylococcus aureus ATCC 25923 were used for quality control. All the culture media, biochemical media and antibiotics used were obtained from Hi Media.

Statistical Analysis

Results obtained were entered in the excel sheet and analyzed by using MS Excel, 2007 version. The percentage of sensitivity and resistance was calculated for all the organisms.

RESULTS

A total of 3300 samples were received during the study period from January 2017 to November 2017, out of which 153 (4.63%) were culture positive for streptococcal isolates. Among streptococcal isolates 128/153 (83.66%) were Enterococcus species, 12/153 (7.84%) were Streptococcus pyogenes, 10/153 (6.53%) were Streptococcus agalactiae and 3/153 (1.96%) were Streptococcus pneumoniae.

<table>
<thead>
<tr>
<th>Antibiotic Name</th>
<th>% R</th>
<th>% IS</th>
<th>% S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>63.4</td>
<td>00</td>
<td>36.6</td>
</tr>
<tr>
<td>Gentamicin High Level (120)</td>
<td>44.3</td>
<td>00</td>
<td>55.7</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>70.3</td>
<td>14.1</td>
<td>15.6</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>46</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Linezolid</td>
<td>00</td>
<td>00</td>
<td>100</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>75</td>
<td>00</td>
<td>25</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>16</td>
<td>4.5</td>
<td>79.5</td>
</tr>
</tbody>
</table>

Table 1. Antimicrobial Profile of Enterococcus Species (n=128)

<table>
<thead>
<tr>
<th>Antibiotic Name</th>
<th>% R</th>
<th>% IS</th>
<th>% S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>00</td>
<td>00</td>
<td>100</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>00</td>
<td>00</td>
<td>100</td>
</tr>
<tr>
<td>Cefoxitin</td>
<td>20</td>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>40</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>30</td>
<td>00</td>
<td>70</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>20</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td>Linezolid</td>
<td>00</td>
<td>100</td>
<td>00</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>00</td>
<td>100</td>
<td>00</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>40</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>100</td>
<td>00</td>
<td>00</td>
</tr>
</tbody>
</table>

Table 2. Antimicrobial Profile of Streptococcus Pyogenes (n=12)

In 128 isolates of Enterococcus species 60% were from in-patient ward (IPD) and 40% were from outpatient department (OPD). For Streptococcus pyogenes, Streptococcus pneumoniae and Streptococcus agalactiae 90% were from IPD and 10% were from OPD. The most common specialties were General Surgery followed by Orthopaedics for all kinds of isolates. For all Streptococcal isolates (153), 64% (98/153) were male patients and 36% (55/153) were female patients. The level of resistance was very high in Enterococcus species as is shown in Table 1. Almost 7.5% of the isolates were resistant to high end drugs like Vancomycin. Even in Streptococcus pyogenes resistance to commonly used antimicrobials such as Erythromycin and Gentamicin was high (up to 33.33%) (Table 2). The Antimicrobial susceptibility of Streptococcus agalactiae is shown in Table 3. In case of Streptococcus pneumoniae it is difficult to comment on the level of resistance as the number of isolates was less but out of three isolates seen in our study one isolate was resistant to Erythromycin.
DISCUSSION
Skin and soft tissue infections are one of the most common infectious diseases worldwide. The treatment of serious SSTIs require prompt anticipation of the severity of infection and timely debridement along with antibiotic cover for the control of infection. Though methicillin resistant Staphylococcus aureus (MRSA) remains one of the most common pathogens responsible for SSTIs but the etiological spectrum is changing and now multidrug resistant Gram-negative organisms and vancomycin resistant enterococcus are amongst few emerging organisms from SSTIs. In the present study 4.63% of the samples were culture positive for streptococcal isolates. The most common was Enterococcus species (83.66%) followed by Streptococcus pyogenes (7.84%), Streptococcus agalactiae (6.53%) and Streptococcus pneumoniae (1.96%). The drug resistant Enterococcus species has emerged as an important nosocomial pathogen over past few years. In our study, 63.4% of Enterococcal isolates were resistant to Amoxicillin while 70.3% showed resistance against Erythromycin, 44.3% were resistant against high-level Gentamicin (HLG). Vancomycin resistant Enterococcal isolates were 7.5%. No resistance was found against linezolid. Such high level of drug resistance to multiple antibiotics in Enterococcal isolates have been observed by other authors also. Recent studies have shown that the vancomycin resistance can vary between 1.7-20% in the tertiary care hospitals of India as was seen in the present study also.

In this present study, we have also investigated antimicrobial activity against S. pyogenes isolates. Resistance was seen to the commonly used antimicrobials such as Erythromycin, Gentamicin (33.3%). No resistance was seen against linezolid and vancomycin. Takashi Takahashi et al has recently reported a high frequency of resistance to erythromycin in Streptococcus pyogenes, particularly in countries where antibiotics are overused. Tamayo et al reported the erythromycin resistance rate to be 21.7% in the study done in Spain in 2004. Alberti et al had also reported a very high level of resistance to fluoroquinolones to the tune of 63.3% amongst S. pyogenes isolates. The increase in resistance in Streptococcus pyogenes isolates is a cause of worry as the SSTI caused by it can progress rapidly and may lead to necrotizing fasciitis and other sequelae if not treated promptly. This becomes important in patients who are allergic to penicillins where these alternate drugs would need to be used.

Streptococcus agalactiae is a major pathogen in neonatal infections. However, an increasing number of diseases caused by GBS in non-pregnant adult-invasive strains has been observed. In adults, S. agalactiae causes skin and soft tissue infections, bacteraemia, urinary tract infections, pneumonia, osteomyelitis, meningitis, endocarditis, and streptococcal toxic shock syndrome. Risk factors associated with invasive GBS in adults are old age, diabetes mellitus, neurologic diseases, cirrhosis or other liver diseases, stroke, breast cancer, and renal failure. In our study, ten isolates of Streptococcus agalactiae and three isolates of Streptococcus pneumoniae were recovered; considered as rare pathogens in suppurative infection. The increase in the prevalence of these relatively uncommon isolates and rising prevalence of drug resistance from the SSTIs warrants that culture and sensitivity should be done from all the suspected cases.

CONCLUSIONS
Streptococcus species such as S. pyogenes, S. Agalactiae and Streptococcus pneumoniae are seen to be increasing in SSTIs. Bacterial isolates exhibited high to moderate levels of resistance against different classes of antibiotics. The susceptibility data from this report may be worth consideration while implementing empiric treatment strategies for pyogenic infections. A continuous inspection should be carried out to monitor the susceptibility of these pathogens and chose appropriate regimens both for prophylaxis and treatment of surgical wound infections. There is a need to create a viable antibiotic policy and draft guidelines to prevent or reduce undirected use of antibiotics, and conserve their effectiveness for better patient management. Consistent dialogue between the microbiology department and the surgeons is required for management of such cases.

REFERENCES


Chaudhary U, Shamma M, Yadav A. The antimicrobial susceptibility patterns of the common and the unusual Enterococcus species which were isolated from clinical specimens. J Infect Dis antimicrob Agents 2007;24(2):55-62.


