Bacteriological Profile And Antimicrobial Susceptibility Pattern of Isolates Among Burn Wound Patients At A Tertiary Care Hospital of Odisha, India

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Abstract:

**Background:** Burns are the most common & devitalising forms of trauma. Infections are the most common cause of mortality and morbidity in these patients. Approximately 75% of mortality following burns are because of infection.

**Aims and objectives:** This study was conducted to determine the bacteriological profile of burn wound infection along with evaluation of antimicrobial susceptibility pattern of the organism isolated

**Material and methods:** Samples from 110 burn patients were collected. Organisms were isolated and identified using standard microbiological methods. AST was done by Kirby Bauer disc diffusion method an ESBL detection done by combined disc test.

**Results:** High culture positivity(92.72%) was seen in our study. Females were affected more. Predominant burning agent was flame (86.3%). Isolation rate of gram negative bacilli was higher compared to gram positive cocci. Pseudomonas aeruginosa was predominant offending agent in 42.4% of cases followed by Staphylococcus aureus, 94.7% of our Staphylococcal isolates were found to be MRSA and 55% of gram negative isolates are ESBL producing. The MRSA isolates were found to be sensitive to Vancomycin and Linezolid and the gram negative organisms were found to be sensitive to Imipenem.

**Conclusion:** Careful microbiological surveillance antibiotic susceptibility testing should be done before the start of antibiotic therapy. Following hospital antibiotic policy will help greatly in prevention and treatment of MDR isolates in burn units thus reducing overall morbidity and mortality.

**Keywords:** Burns, MRSA, Pseudomonas aeruginosa,Staphylococcus aureus

Date of Submission: 08 -09-2017  Date of acceptance: 20-09-2017

I. Introduction

Burns are the most common & devitalising forms of trauma. Major burns can be defined as any burn that requires intravenous resuscitation fluid or covers 10% of body surface area in adult and/or burn that involves the airways.3 Burn site which remains relatively sterile during the first 24 hours became colonised commonly by gram negative bacteria.3 Clinical diagnosis of bacteremia and or sepsis is difficult for a number of reasons. It could be symptomatic or asymptomatic as a result of immunodeficiency secondary to thermal injury, malnutrition, anemia due to impaired reperfusion and damage to immunological barrier.4Infections are the most common cause of mortality and morbidity in these patients. Approximately 75% of mortality following burns are because of infection.4,9,10,11

Pseudomonas aeruginosa has emerged as a predominant member of the burn wound flora and in absence of topical therapy it is cultured from 70% patients with burn wound by third week.12 Microorganism routinely isolated from burn wounds include aerobic organisms like Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Klebsiella spp,Proteus etc,anerobic organisms like Bacteroides spp, Peptostreptococcus, Propionibacterium and fungi like Aspergillus niger, Candida spp, and Zygomycetes.13 Periodical culturing and surveillance of potential microorganisms and their sensitivity pattern may alert early management & help in decrease in morbidity and mortality in burn patients.

This study was conducted to determine the bacteriological profile of burn wound infection in the 1st week post burn along with evaluation of antimicrobial susceptibility pattern of the organism isolated.

II. Materials And Methods

2.1 Study type and study design: Observational descriptive study with Cross sectional design was conducted .

2.2 Study duration: February 2016 to July 2016

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### 2.3 Settings and location:

The study was conducted in the department of Microbiology, SCBMCH, Cuttack, India

### 2.4 Materials And Methods:

Hundred and ten (110) burn patients were evaluated over a period of 6 months from February 2016 to July 2016. Specimens were collected in 1st week preferably between 3rd to 5th day post admission in the form of wound swabs (two). One swab was inoculated onto Blood agar and MacConkey agar and put into nutrient broth and incubated at 37 degree overnight. Gram stain was performed from the second swab. Isolated organisms were identified by standard microbiological methods. Antimicrobial susceptibility test of the isolates was done by Kirby Bauer disc diffusion method. Among the gram negative organisms ESBL detection was done by combined disc test using ceftazidime & ceftazidime-clavulanic acid discs. Among the *Staphylococcus aureus* isolates methicillin resistance was detected using cefoxitin disc method.

### III. Results

Among 110 samples, 102 (92.72%) were culture positive from which a total 125 organisms were isolated. Multiple organisms were isolated in 23 (22.55%) cases. Females (64%) were affected more than males (36%). The predominant age group affected was 15-30 years. The burning agent was predominantly flame 92 (83.6%) followed by scald (6.3%) electrical (6.5%), blast injury (3.6%) and 1 was due to acid. Of the 125 isolates gram negative organisms were found to be the major isolates (77%).

The predominant organism was *Pseudomonas aeruginosa* 53 (42.4%) followed by *Staphylococcus aureus* 19 (15.2%), *Klebsiella* spp 13 (10.4%), *Proteus* spp 9 (7.2%), *Escherichia coli* 9 (7.2%), *Enterobacter* spp 7 (5.6%), *Enterococcus* spp 7 (5.6%), *Acinetobacter* spp 6 (4.8%), *Candida albicans* 2 (1.6%) only. Among the *Staphylococcus aureus* isolates 18 (94.7%) were found to be MRSA and among the gram negative isolates 53 (55%) were found to be producer of ESBL by combined disc method. The MRSA isolates were found to be sensitive to Vancomycin and Linezolid and the majority of gram negative organisms were found to be sensitive to Imipenem.

### IV. Discussion

Burn wound monitoring requires the study of changing bacterial flora and their antibiotic susceptibility pattern. This will help to have the knowledge about the predominant organisms in a particular health care facility and antimicrobial pattern of those isolates will help to formulate the antibiotic policy. Incidence of burn was found to be higher in females (90%) because they mostly do the kitchen work where accidents occur. The age group mostly affected was between 15-30 years. The burning agent was predominantly flame 92 (84.4%), followed by electrical 6 (5%) which was similar to findings of Sharma L et al. High culture positivity 92.72% was seen in our study which was at par with other studies. Isolation rate of gram negative bacilli was higher compared to gram positive cocci. This is in contrast to other studies where isolation of *Staphylococcus aureus* was much higher. *Pseudomonas aeruginosa* was predominant offending agent in 42.4% of cases which was at par with the study conducted by Sharma S et al. Among the gram positive cocci *Staphylococcus aureus* was predominant in 15.2% of cases followed by *Enterococcus* spp.

Antibiotic sensitivity pattern revealed that many of the isolates were resistant to commonly used antibiotics. MRSA prevalence in our centre was very high 94.73% which was in contrast to other studies. These isolates were found to be sensitive to Vancomycin and Linezolid. Among the gram negative isolates 55% were found to be ESBL producer which was similar to a study by Bayram Y et al. Imipenem was the most active antimicrobial agent for ESBL producing strain. The high percentage of multidrug resistant isolates is probably due to empirical use of broad spectrum antibiotics and non-adherence to hospital antibiotic policy. Early detection of isolates is very important to prevent treatment failure. In case of polymicrobial infection which is seen in 22.5% of our cases the potential virulence of one organism will affect another organism growing alongside. Multidrug resistant organisms further complicate the scenario.

### V. Conclusion

Careful microbiological surveillance and antibiotic susceptibility testing should be done before the start of antibiotic therapy. Following hospital antibiotic policy will help greatly in prevention and treatment of MDR isolates in burn units thus reducing overall morbidity and mortality.

### References


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Tables

Table 1. Agents causing burn injury

<table>
<thead>
<tr>
<th>Burning Agents</th>
<th>Number(Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame</td>
<td>92(83.6%)</td>
</tr>
<tr>
<td>Scald</td>
<td>7(5.4%)</td>
</tr>
<tr>
<td>Electrical</td>
<td>6(5.4%)</td>
</tr>
<tr>
<td>Blast Injury</td>
<td>4(3.6%)</td>
</tr>
<tr>
<td>Acid</td>
<td>1(.01%)</td>
</tr>
</tbody>
</table>

Table 2. Isolates from burn injury cases

<table>
<thead>
<tr>
<th>Name Of The Bacteria</th>
<th>Number(Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudomonas Aeruginosa</td>
<td>53 (42.4%)</td>
</tr>
<tr>
<td>Staphylococcus Aureus</td>
<td>19 (15.2%)</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>13 (10.4%)</td>
</tr>
<tr>
<td>Proteus Spp</td>
<td>9 (7.2%)</td>
</tr>
<tr>
<td>Escherichia Coli</td>
<td>9 (7.2%)</td>
</tr>
<tr>
<td>Enterobacter Spp</td>
<td>7(5.6%)</td>
</tr>
<tr>
<td>Enterococcus Spp</td>
<td>7 (5.6%)</td>
</tr>
<tr>
<td>Acinetobacter Spp</td>
<td>6 (4.8%)</td>
</tr>
<tr>
<td>Candida Spp</td>
<td>2 (1.6%)</td>
</tr>
</tbody>
</table>
SUSCEPTIBILITY PATTERN OF *Staphylococcus aureus* ISOLATES (N=19)

* Bimoch Projna Paty. "Bacteriological Profile And Antimicrobial Susceptibility Pattern of Isolates Among Burn Wound Patients At A Tertiary Care Hospital of Odisha, India." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.9 (2017): 20-23

DOI: 10.9790/0853-1609062023  www.iosrjournals.org