Prevalence of Different Bacteria and Their Antibiotic Susceptibilities in BCC Pims

Usman Ali, Muhammad Rehan, Muhammad Shais Khan, and Tariq Iqbal*
Burn Care Centre PIMS, SZAB Medical University, Pakistan

Abstract

**Introduction:** Burn injuries are a major Public Health concern. Microorganism infection is a great challenge in the management of patients in hospital settings. This challenge increases many folds in burn patients as they are the most vulnerable for infection. The purpose of our study was to identify major microorganisms in our setting. Also the study highlights major susceptibilities of the bugs. This antibiogram data will help in planning for empirical therapy for acute burn patients.

**Methods:** An observational descriptive study conducted from February 2016 to July 2016 in Burn Care Center (BCC), PIMS, SZAB Medical University, and Islamabad. The study included all patients of either gender of all ages admitted in BCC during this period. Sample size was 258 swab cultures and their susceptibilities. Data was collected from the culture reports of patients admitted during the study time period. Data was entered and analyzed using SPSS version 20.

**Results:** A total of 258 culture reports were assessed. These swab cultures were carried out on admitted patients at BCC, Islamabad. Out of the total 141 (54.7%) were male patients while 117 (45.3%) were females. Child population comprised of 102 (39.5%). Among 258 samples 47 (18.2%) revealed no growth. Pseudomonas species has the highest number i.e 108 (41.9%) in swab culture reports. Swab cultures showing Klebsiellapneumoniae were 60 (23.2%). Staphylococcus aureus (MRSA) in our patients was 30 (11.6%). Klebsiellapneumoniae has maximum susceptibility with polymixin B 49 (81.7%). Along with polymyxin B, Tigycyline susceptibility was 44 (73.3%). Pseudomonas aeruginos showed maximum susceptibility with Polymyxin B 79 (73.1%). Along with Polymyxin B, Piperacillin + Tazobactum was sensitive in 46 (42.5%). Staphylococcus aureus susceptibility was 27 (90%) with Linezolid.

**Conclusion:** Pseudomonas spp. predominates the swab culture isolates of our setup. MDR and MRSA cases are on the lower side due to strict practices of regularly updated Antibiogram and specialized care of wounds and advances techniques of patient management at BCC Islamabad.

**INTRODUCTION**

Burn injuries are a major Public Health concern. Microorganism infection is a great challenge in the management of patients in hospital settings. This challenge increases many folds in burn patients as they are the most vulnerable for infection. This has been implicated in many studies. Major constituent of infection are Bacteria (Gram negative as well as gram positive) [1]. Bacterial isolates from burn patients changes with time [2]. That is why there is need for time to time update of pathogenic infection data in a burn center.

Antibiotic resistance is an emerging concern for medical professionals. Studies have shown that antibiotic resistance is increasing rapidly and becoming a crisis for public health [3]. Due to antimicrobial resistance, bacterial infections have become a threat to the patients’again [4]. This resistance has been developed due to misuse and overuse of antibiotics. Empirical therapy has a major role in acute cases. Without evidence and limited research use of antibiotics is promoting resistance to them. The purpose of our study was to identify major microorganisms in our setting. Also the study highlights major susceptibilities of the bugs. This antibiogram data will help in planning for empirical therapy for acute burn patients.

**METHODS**

An observational descriptive study conducted from February 2016 to July 2016 in Burn Care Center (BCC), PIMS, SZAB Medical University, and Islamabad. Sample size was 258 swab cultures and their susceptibilities. Data was collected using standard collection techniques and analyzed at microbiological laboratory from the culture reports of patients admitted during the study time period. Patients of all age groups, gender and types of burns were included in the study. Samples were taken from patients when they have shown the signs of infection during the change of dressings. Samples were repeated in patients having hospital stay of more than one week. Culture reports of patients received from outpatient department were excluded.

Swab cultures were taken from burnt area that is deep and showing signs of infection i.e. having pus discharge, swelling, and redness. In case of signs of systemic infection like fever, antibiotics were given empirically after taking the swab samples while waiting for culture reports. Sampling was done before wound wash at the time of dressing in a sterile cotton swab. Samples were taken by rubbing swab over the burn wound and sent for culture and susceptibility to the laboratory. Cultures were inoculated Mac Conkey agar and Blood agar and incubated...
for 24 hours. After incubation gram staining was done on plates showing microbial growth. Disc Diffusion Method was used to identify antibiotic susceptibilities on plates with microbial growth. After receiving the reports data was entered and analyzed using SPSS version 20.

RESULTS

A total of 258 culture reports were assessed. These swab cultures were carried out on admitted patients in BCC, Islamabad. Out of the total 141 (54.7%) were male patients while 117 (45.3%) were females. Child population comprised of 102 (39.5%). Mean age 21 years (range 11 months to 55 years). Flame burns were 125 (48.4%). Scald burns percentage was 97 (37.6%). Others included electric burns and chemical burns were 34 (13.1%) and 2 (0.08%) respectively.

Among 258 samples 47 (18.2%) revealed no growth. Gram negative bacterial growth was 194 (75.1%) of the total swab culture reports. *Pseudomonas* species has the highest number i.e 108 (41.9%) in swab culture reports. Swab cultures showing *Klebsiella pneumoniae* were 60 (23.2%). *Klebsiella* and *Pseudomonas* was present combine in 26 (10.1%) culture reports. *Staphylococcus aureus* (MRSA) in our patients was 30 (11.6%).

*Staphylococcus aureus* showing number i.e 108 (41.9%) in swab culture reports. Swab cultures susceptibility was 44 (73.3%). Other susceptibilities for polymixin B 49 (81.7%). Along with polymixin B, Tigycyline was combining susceptible to Gram negative bacterial growth was 194 (75.1%) of the total 34 (13.1%) and 2 (0.008%) respectively.

(Pseudomonas) in our patients was 30 (11.6%). Other susceptibilities for polymixin B 49 (81.7%). Along with polymixin B, Tigycyline was combining susceptible to Gram negative bacterial growth was 194 (75.1%) of the total 34 (13.1%) and 2 (0.008%) respectively.

*Klebsiella pneumoniae* has maximum susceptibility with polymixin B 49 (81.7%). Along with polymixin B, Tigycyline susceptibility was 44 (73.3%). Other susceptibilities for *Klebsiella* are shown in Table 2.

*Pseudomonas aeruginosa* showed maximum susceptibility with Polymixin B 79 (73.1%). Along with Polymixin B, Piperacillin + Tazobactum were susceptible in 46 (42.5%) culture reports of *Pseudomonas* species. Susceptibility for Imipenem was in 35 (32.4%) reports. Other susceptibilities for *Pseudomonas* are shown in Table 2.

*Staphylococcus aureus* sensitivity was 27 (90%) with Linezolid. Vancomycin has susceptibility in 24 (80%) *Staphylococcus aureus* cultures. Chloramphenicol, Doxycyline had sensitivities 19 (63.3%), 14 (46.7%) respectively. Both *Klebsiella* and *Pseudomonas* was combining susceptible to Levofloxacin in 5 (19.2%) reports. Same percentage was found for Imipenem. In most of the samples the susceptibility only matched for Polymixin B (Table 2).

### Table 1: Prevalence of swab culture isolates of BCC, PIMS Islamabad.

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Percentage prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pseudomonas</em></td>
<td>41.9% (108)</td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>23.2% (60)</td>
</tr>
<tr>
<td><em>Klebsiella</em> and <em>Pseudomonas</em> combine</td>
<td>10.1% (26)</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em> (MRSA)</td>
<td>11.6% (30)</td>
</tr>
<tr>
<td><em>Proteus</em> species</td>
<td>7.4% (19)</td>
</tr>
<tr>
<td><em>Candida</em></td>
<td>5.4% (14)</td>
</tr>
<tr>
<td><em>Acinetobacter</em></td>
<td>2.7% (07)</td>
</tr>
<tr>
<td>No growth</td>
<td>18.2% (47)</td>
</tr>
</tbody>
</table>

### Table 2: Percentage Antibiotic Susceptibilities of *Pseudomonas* and *Klebsiella*.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th><em>Pseudomonas</em> (% susceptibility)</th>
<th><em>Klebsiella</em> (% susceptibility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymixin B</td>
<td>73.1% (79)</td>
<td>81.7% (49)</td>
</tr>
<tr>
<td>Piperacillin + Tazobactum</td>
<td>42.5% (46)</td>
<td>30% (18)</td>
</tr>
<tr>
<td>Tigycyline</td>
<td>No susceptibility</td>
<td>73.3% (44)</td>
</tr>
<tr>
<td>Imipenem</td>
<td>32.4% (35)</td>
<td>31.7% (19)</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>25.9% (28)</td>
<td>8.3% (05)</td>
</tr>
<tr>
<td>Cefoperazone + Sulbactum</td>
<td>24.1% (26)</td>
<td>35% (21)</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>17.6% (19)</td>
<td>20% (12)</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>No susceptibility</td>
<td>10% (06)</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>10.2% (11)</td>
<td>No susceptibility</td>
</tr>
</tbody>
</table>

DISCUSSION

Microbial pattern has importance epidemiologically as well as Public Health concern. The study was conducted to highlight microbial pattern in our burn patients. Also it provides ground for effective antibiotic therapy by evaluating antibiotic susceptibilities of swab culture reports, helping to maintain the antibiogram for empirical therapy and to upgrade it regularly.

Gram negative bacteria predominate in our setup. The most common bug at our setup was *Pseudomonas* species (about 40%). A similar study conducted in Karachi has shown results similar to our study i.e. *Pseudomonas* prevalence was 36.6% [5] in flame burn victims. Major susceptibility of *Pseudomonas* in Karachi study was for Imipenem (about 75%) [5], that was very high as compared to our study (showing 32.4% sensitivity for imipenem). More observation, data and research is required for these low percentages of Imipenem susceptibilities in our population. *Pseudomonas* in our population shows maximum susceptibility for Piperacillin + Tazobactum as shown in results.

Another study by same author showed highest prevalence of *Staphylococcus aureus* in the 1st week in fire burn victims. *Pseudomonas* species were more prevalent in the 5th week after burn injury [6]. The data from our study and Karachi study was comparable and similar to the data collected in Quetta showing *Pseudomonas* 37% and *Staphylococcus* 14%. Amikacin was found predominant antibiotic susceptible to the both microbes in the Quetta study [7]. Iranian Burn Center has reported that *Pseudomonas* is the most common microorganism in their culture reports (around 32.2%) [8]. Another study from Iran showed about 47% *Pseudomonas* isolates in burn victim cultures. Imipenam was most effective drug in these isolates with a resistance rate of 23.3% [9].

A study from a neighboring country has *Staphylococcus aureus* percentage comparable to our study (13.6% versus 11.6%) in their culture reports of chronic burn wounds [10]. Over the years *Pseudomonas* species has been persistently on the top along with *Staphylococcus* among other microorganisms in the culture reports. *Pseudomonas* (33.7%) and *Staphylococcus* (27.7%) were predominant in wound swab isolates in an Indian study [11]. Similar results were observed in an Ethiopian study [12]. A study in Delhi two decades ago has shown *Pseudomonas*
spp. in 36% isolates [13]. These trends of infectious agents are similar over the years but antibiotic susceptibility has changed rapidly with time. Swedish burn center study has revealed high risk for carbapenem resistant P. aeruginosa over the years [14].

Turkish study has revealed Acinetobacter as the most frequent isolate (23.6%), which contradicts to study in our region showing Acinetobacter in about 3% isolates on only [15]. While Staphylococcus isolates in Turkish study has values similar to our population data (11.2% versus 11.6%). Polymyxin B has highest susceptibility among microbes in our setup including Pseudomonas spp. This has been also observed in other studies showing low resistance of microbes to Polymyxin B [16].

Antimicrobial resistance, Multiple Drug Resistance (MDR), is a major challenge of this era. MDR and MRSA increase mortality and medical costs and decrease the antibiotic effectiveness [17]. Due to good hand hygiene techniques, patient isolation and use of modern ways of wound management of burn victims MDR and MRSA cases lower at BCC Islamabad. MRSA at our setup is 11.6% that is below 25% as many countries now have MRSA > 25% in EU/EEA [18]. Prolonged usage of broad-spectrum antibiotics should be avoided. Also delayed antibiotic therapy increases mortality and septic shock in patients [19]. For these reasons antibiogram needs to be updated regularly and antibiotic choice should be individualized.

CONCLUSION

Pseudomonas spp. predominates the swab culture isolates of our setup. MDR and MRSA cases are on the lower side due to specialized care and advances techniques of wound management at our center. Antibiogram should be updated regularly for effective empirical therapy. Prolonged use of antibiotics should be avoided. More studies with serial weekly culture swabs are required. Also there is need to establish antibiogram according to different types of burns.

REFERENCES