Bacteriological Profile of Burn Patients in a Tertiary Care Hospital, Jamnagar, Gujarat, India

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A B S T R A C T

Infection is a common cause of morbidity and mortality in burn patients. Clinical diagnosis of bacteremia and/or sepsis in burn patients is difficult for a number of reasons. It could be symptomatic and/or asymptomatic as a result of immune deficiency secondary to thermal injury. To determine the bacteriological profile from burn patients and their resistance pattern for the various antibiotics. This Retrospective study was carried out in the Department of Microbiology, Shri M. P. Shah Government Medical College, Jamnagar, Gujarat from June 2014 to June 2015 from burns ward, Guru Govind Singh Govt. Hospital Jamnagar. A total of 471 swab samples were cultured by conventional method. Antibiotic susceptibility test of the isolates was determined by Kirby bauer disc diffusion method. 471 swab samples of 246 patients were enrolled in the study group of whom 56.69% were found bacteremic and 43.31% were found sterile. 262 isolates of 10 different bacteria were obtained from swab samples, of which Pseudomonas aeruginosa (33.08%), Klebsiella spp.(28.57%), Acinetobacter spp. (14.66%), Staphylococcus aureus (14.28%) were predominant. The present study conclude that aggressive infection control measures should be applied to limit the emergence and spread of multi drug resistant pathogens.

Keywords
Burn, Swab samples, Nosocomial infection, Antibiotic Resistance.

Article Info
Accepted: 21 July 2016
Available Online: 10 August 2016

Introduction

Burn wound infection is one of the most common causes of mortality and morbidity in burn patients (Sedat et al., 2005). It has been estimated that 75% of all deaths following thermal injuries are related to infections (Vindenes et al., 1995). The rate of nosocomial infections are higher in burn patients due to various factors like nature of burn injury itself, immunocompromised status of the patient, invasive diagnostic and therapeutic procedures and prolonged ICU stay (Pruitt et al., 1998).

Initially, the burnt area is considered free of microbial contamination. But gram-positive bacteria in the depth of sweat glands and hair follicles heavily colonized the wound within 48 hours of the injury (Luterman; Mooney, 1989). Topical antimicrobials decrease microbial overgrowth but seldom prevent further colonization with other potentially invasive bacteria. These are derived from patient’s gastrointestinal and upper respiratory tract and the hospital environment (Monafo et al., 1987; Hansbrough, 1987). Following colonization, these organisms start penetrating the viable tissue depending on their invasive capacity, local wound factors and degree of the
The causative infective microorganisms in any burn facility change with time. Individual organisms are brought into burns ward on the wounds of new patients. These organisms persist in the resident flora of the burn treatment facility for a variable period of time, only to be replaced by newly arriving microorganisms. Introduction of new topical agents and systemic antibiotics influence the flora of the wound (Pruitt et al., 1984; Manson et al., 1992).

The importance of preventing infection has been recognized in organized burn care centers starting from its inspection. These include strict aseptic techniques, use of sterile gloves and dressing materials, wearing mask for dressing changes and special separation of patients, using private rooms (Sharma, 2005).

**Materials and Methods**

This retrospective study was carried out in the Department of Microbiology, Shree M.P. Shah Govt. Medical College and G.G.G. Hospital, Jamnagar, Gujarat from June 2014 to June 2015. We have included pus swab samples and excluded other samples like blood, urine, stool and other body fluids. A total of 471 pus swab samples were received from burns ward of Guru Gobind Singh Govt. Hospital, Jamnagar.

All the samples were inoculated on MacConkey agar, Blood agar and Nutrient agar plates. The culture plates were incubated aerobically for 24 hrs at 37°C. Growth and cultural characteristics were observed next day. Bacterial pathogens were identified by conventional biochemical methods according to standard microbiological techniques. Anti-microbial sensitivity testing was done according to the CLSI (Clinical and Laboratory Standards Institute) guidelines (CLSI, 2014) by Kirby bauer disc diffusion method for Amikacin (30mcg), Netilmycin(30mcg), Gentamycin (10mcg), Ceftazidine(30mcg), Piperacillin+ Tazobactum (100mcg/10mcg), Aztreonem (30mcg), Imipenem (10mcg), Ciprofloxacin (5mcg), Azythromycin(30 mcg), Linezolid (30 mcg) and Vancomycin(30 mcg).

**Ethical clearance**

It is a retrospective analysis of samples tested for routine laboratory diagnosis; hence ethical clearance is not necessary.

**Statistics**

Data was entered and analyzed in MS excel 2007.

**Results and Discussion**

In the present study, bacterial isolates were found in 267 (56.69%) swab samples & 171 (43.31%) were found sterile. Table -1 shows that 43 (16.41%) isolates were gram positive organisms and 219(83.59%) were gram negative organisms. Table-2 shows that *Pseudomonas aeruginosa* was the commonest pathogen isolated (33.59%). Other isolates include *Klebsiella* spp. (29.01%), *Acinetobacter* spp. (14.89%), *Staphylococcus aureus* (14.50%), *E.coli* (3.44%), *Proteus* spp. (2.66%) and *Enterococcus* spp. (1.91%).

The Susceptibility of the organisms to different antibiotics varied depending on the isolates. Table-3 shows Antibiotic Resistant pattern of Gram negative bacilli. *Pseudomonas aeruginosa* was highly resistant to Gentamicin (89.77%) and least resistant to Imipenem (15.90%). *Acinetobacter* spp. was highly resistant to...
Ceftazidime (93.54%) and least resistant to Imipenem (48.71%). Resistant to Gentamicin (86.84%) and Ceftazidime (86.84%) were high for the Klebsiella spp. Other gram negative bacilli were least resistant to imipenem (50.00%). P. aeruginosa and Acinetobacter spp. were found to be Multidrug resistant. 33 (37.5%) isolates of P. aeruginosa and 25 (64.10%) isolates of Acinetobacter spp. were multidrug resistant.

Table 4 Resistant pattern of Gram positive cocci. S. aureus and Enterococci spp. show 0% resistant to both for Vancomycin and Linezolid.

Table 1 No. of gram positive and gram negative organisms isolated

| Type of Organisms | No. of strains | Percentage |
|------------------|----------------|------------|
| Gram Positive Organisms | 43             | 16.41%     |
| Gram Negative Organisms | 219            | 83.59%     |

Table 2 Various isolate recovered from burns patients

| Organism                  | No. (out of 262 isolates) | Percentage (%) |
|---------------------------|----------------------------|----------------|
| Pseudomonas aeruginosa    | 88                         | 33.59          |
| Klebsiella spp.           | 76                         | 29.01          |
| Acinetobacter spp.        | 39                         | 14.89          |
| Staphylococcus aureus     | 38                         | 14.50          |
| Escherichia coli          | 9                          | 3.44           |
| Proteus spp.              | 7                          | 2.66           |
| Enterococcus spp.         | 5                          | 1.91           |

Table 3 Antibiotic resistant pattern of gram negative organisms

| Name of antibiotics | P. aeruginosa N=88 Resistance (%) | Acinetobacter spp. N= 39 Resistance (%) | Klebsiella spp. N= 76 Resistance (%) | Other Gram Negative Microorganisms N= 16 Resistance (%) |
|---------------------|----------------------------------|----------------------------------------|---------------------------------------|---------------------------------------------------------|
| Ceftazidime (CAZ)   | 68 (77.27%)                      | 29 (93.54%)                            | 66 (86.84%)                           | 10 (62.5%)                                              |
| Piperacillin+ Tazobactum(PT) | 48 (54.54%)                      | 30 (76.92%)                            | 49 (64.47%)                           | 9 (56.25%)                                              |
| Imipenem (IMP)      | 14 (15.90%)                      | 19 (48.71%)                            | 51 (67.10%)                           | 8 (50.00%)                                              |
| Gentamicin (GEN)    | 79 (89.77%)                      | 31 (79.48%)                            | 66 (86.84%)                           | 14 (87.5%)                                              |
| Ciprofloxacin (CIP) | 76 (86.36%)                      | 33 (84.61%)                            | 65 (85.52%)                           | 15 (93.75%)                                              |
| Netilmicin (NET)    | 66 (75.00%)                      | 20 (51.28%)                            | 55 (72.36%)                           | 11 (68.75%)                                              |
| Colistin (CL)       | 0 (0%)                           | 0 (0%)                                 | NT                                    | NT                                                      |

(*NT = Not Tested)
Table 4 Antibiotic resistant pattern of gram positive organisms

| Name of antibiotics | S. aureus (N=38) Resistance (%) | Enterococcus spp. (N=5) Resistance (%) |
|---------------------|---------------------------------|----------------------------------------|
| Erythromycin        | 47.37                           | 80                                     |
| Clindamycin         | 26.31                           | NT                                     |
| Linezolid           | 0                               | 0                                      |
| Vancomycin          | 0                               | 0                                      |
| Ciprofloxacin       | 42.10                           | 80                                     |
| Ampicillin          | 94.28                           | 100                                    |

(*NT = Not Tested)

In the present study, the most commonly isolated organism from burn patients was *Pseudomonas aeruginosa*, followed by *Klebsiella* spp., *Acinetobacter* spp. and *S. aureus* were predominant. A study done by Manjula et al., (2007) shows that most commonly isolated organism was *Pseudomonas aeruginosa* (51.5%) followed by *Acinetobacter* spp. (14.28%), *S. aureus* (11.15%), *Klebsiella* spp. (9.23%) were predominant. Other study done by Ganesamoni S. et al., (2010) also shows that commonest organism was *P. aeruginosa* (81.1%), followed by *Acinetobacter* spp. and *S. aureus*.

The bacterial resistance pattern is important for clinical and epidemiological purpose. A comparative study done by Indu et al., (2014) shows that *P. aeruginosa* was 81.03% and 18.9% resistant to Gentamicin and Imipenem respectively. A study done by Yasemin et al., (2013) shows that for *Acinetobacter* spp., resistance to Ceftazidime, Gentamicin, Ciprofloxacin and Imipenem were 93%, 86%, 86% and 86% respectively. For vancomycin and linezolid resistance, comparative done by Yasemin et al., (2013) shows 0% resistance for both the drugs, which are comparable to present study.

The main limitations of present study are retrospective study design and collection of data from a single burn centre. There is also unavailability of culture isolates for molecular analysis or additional testing to determine if isolates were acquired through nosocomial transmission. It is also known that widespread use of broad spectrum antimicrobials in burn units may lead to acquisition of resistance and transformation to form new strains (Chim et al., 2007).

The present study conclude that isolation of multidrug resistant should be considered as a serious risk in burn units. Routine microbiological surveillance and careful in vitro testing prior to antibiotic use and strict adherence to hospital policy.

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**How to cite this article:**

Pooja A. Kamaria, Binita J. Aring and Mala Sinha. 2016. Bacteriological Profile of Burn Patients in a Tertiary Care Hospital, Jamnagar, Gujarat, India. *Int.J.Curr.Microbiol.App.Sci.* 5(8): 832-836. doi: [http://dx.doi.org/10.20546/ijcmas.2016.508.093](http://dx.doi.org/10.20546/ijcmas.2016.508.093)