

Analysis of the bacterial infections in burn patients at Taleghani Burn Hospital in Ahvaz, Khuzestan province

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ABSTRACT

Background: The major challenge for a burn team is nosocomial infection, which is known to be responsible for over 50% of burn-related deaths. Most studies on infection in burn patients focus on burn wound infection, whereas other nosocomial infections among these patients have not been addressed well. This study attempts to determine three types of nosocomial infections: burn wound, urinary tract, and blood stream infections on the basis of National Nosocomial Infection Surveillance System (NNIS) definition.

Materials and methods: During an academic year (May 2003 to April 2004), 182 patients were included. Blood, urine and wound biopsy samples were taken 7 and 14 days following the admission. Isolation and identification of microorganisms were performed according to the reference procedures. Susceptibility testing was carried out using disk diffusion procedure as recommended by Clinical and Laboratory Standard Institute.

Results: Of 182 patients, 140 (76.9%) acquired at least one type of infection. A total of 116 patients (82.8%) were culture positive on day 7th while 24 (17.2%) were positive on day 14th. Primary wound infection was the most common infection (72.5%), followed by blood stream (18.6%) and urinary tract infections (8.9%). The most frequent microorganisms were pseudomonas aeruginosa (37.5%), staphylococcus aureus (20.2%), and acinetobacter baumannii (10.4 %). Among these isolates, P. aeruginosa was found to be 100% resistant to amikacin, gentamicin, carbenicillin and ciprofloxacin. It is worth to note that 58% of S. aureus and 60% of coagulase-negative staphylococcus isolates were methicillin resistant (MRSA).

Conclusion: High prevalence of nosocomial infections, presence of multi-drug resistant bacteria, and MRSA are serious health concerns in burn patients at Taleghani hospital. We, therefore, concluded that continuous surveillance of burn infections is warranted in this high-risk group of patients in order to develop strategies for antimicrobial resistance control and treatment of infectious complications.

Keywords: Burn patients, Nosocomial infection.

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INTRODUCTION

In spite of considerable advances in medicine and specific treatment of burn, infection continues

to pose the greatest danger to burn patients. Approximately 73% of all deaths within the first 5 days post burn are directly or indirectly caused by septic processes (1). Currently the common pathogens isolated from burn patients are, P. aeruginosa, S. aureus, Klebsiella spp. and various

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coliform bacilli. Fungi (*Candida albicans*, *Aspergillus fumigatus*) can also cause infection (2,3).

Multidrug-resistant bacteria have frequently been reported as the cause of nosocomial outbreaks of infection in burn units or as wound colonizers in burn patients (4,5). Similarly, antimicrobial resistance in some of the most frequent bacterial species isolated from burn patients in Iran such as *S. aureus* or *P. aeruginosa*, and other gram negative bacilli has reached alerting levels (6,7). Based on National Nosocomial Infection Surveillance System (NNIS) criteria, the followings should be evaluated among all burn patients: (i) the distribution of bacterial species among burn isolates, and (ii) the antimicrobial susceptibility of the pathogens in order to adapt empirical antibiotic strategies (8).

Our aim was to determine the nosocomial infections and the incidence of bacterial pathogens isolated from burn patients at Taleghani Burn Hospital in Khuzestan province, Ahvaz, during an academic year. Meanwhile, susceptibility of these isolates to various antibiotics was evaluated.

PATIENTS and METHODS

We studied 182 patients admitted to the Taleghani burn hospital affiliated to Ahvaz Jundi-Shapour University of Medical Sciences during an academic year (May 2003 to April 2004). This hospital welcomes patients from all around Khuzestan province.

Included patients failed to have signs and symptoms of urinary tract infection (UTI), blood stream infection (BSI), and wound infection (WI) based on NNIS system criteria within the first 48 hours after the admission.

Blood, urine and wound biopsy samples were taken on days 7th and 14th after admission, then, cultured on blood agar and MacConkey agar. Isolation and identification of microorganisms

were achieved according to reference procedures (9).

Disk diffusion test was performed for all isolates according to the Clinical and Laboratory Standard Institute protocol (10). Briefly, a 0.5 McFarland standardized suspension of bacteria was swabbed over the surface of Muller-Hinton agar plate, and paper disk containing concentration of each antibiotic were placed on to the inoculated surface. After over night incubation at 35⁰C, the diameters of the zones produced by antibiotic of bacterial growth were measured and the isolate was interpreted.

Data were analyzed by SPSS for Windows (version 10.5, USA).

RESULTS

The study population included 108 males (59.3%) and 74 females (40.7%) with the mean age (\pm standard deviation) of 19.3 \pm 17.1 years (a range, 1-70 years).

On days 7th and 14th, 82.8% and 17.2% of cultures revealed to be positive, respectively. Totally, 140 (76.9%) patients suffered at least from one type of nosocomial infections (UTI, BSI and WI). The wound infection was, by far, the most frequently (72.5%) observed infection, followed by blood infection (18.6%) and urinary tract infection (8.9%).

The most predominant bacterial isolate was *Pseudomonas aeruginosa* followed by *Staphylococcus aureus*, *Acinetobacter baumannii*, *Proteus mirabilis*, and *Escherichia coli*.

It is worth to note that 58% of *S. aureus* and 60% of *Staphylococcus Coagulase negative* were methicillin resistant. However, these isolates were susceptible to Vancomycin and Teicoplanin. In susceptibility test, *P. aeruginosa* was 100% resistant to Gentamicin, Cephalothin, Ciprofloxacin, Amikacin, Carbenicilin, Ceftazidime, and Tobramycin (table 1).

Table 1. Antimicrobial susceptibility pattern of isolates in burn patients referring to Taleghani hospital

| Antibiotic | Organism (s) | | | | |
|---------------|------------------------|-----------|------------------------|----------------------|----------------|
| | DC/disk (μ /I) | S. aureus | Enterobac teriaceae | P. aeruginos a | A. baumanni |
| Gentamycin | 10 | 73.3 | 70 | 100 | 100 |
| Cephalothin | 30 | 73.3 | 28.5 | 100 | 100 |
| Ciprofloxacin | 05 | 73.3 | 19 | 100 | 85 |
| Cephalexin | 30 | 74 | 95 | 98 | 90 |
| Clindamycin | 02 | 75 | ND | ND | ND |
| Oxacillin | 01 | 58 | ND | ND | ND |
| Vancomycine | 30 | 0.0 | ND | ND | ND |
| Amikacin | 30 | ND | 42.3 | 100 | 100 |
| Ampicillin | 10 | 95 | 100 | ND | ND |
| Carbenicillin | 100 | ND | 42 | 100 | 100 |
| Cotrimoxazole | 1.25/ 23.75 | 89 | 38 | ND | ND |
| Ceftazidine | 30 | 75 | 55 | 100 | 100 |
| Tobramycin | 10 | ND | 65 | 100 | 70 |

ND: Not done, DC: Drug concentration

DISCUSSION

Despite significant improvement in the survival of burn patients, infectious complications continue to be the major cause of morbidity and mortality. Although, control of invasive bacterial burn wound infection, strict isolation techniques and infection control policies have significantly minimized the occurrence of burn wound infection (11), our study strongly reports the high prevalence of bacterial infections among burn patients at Taleghani burn hospital as compared to previous study (12).

We clearly indicate that the wound infection is the most common cause of nosocomial infection. Similarly, Lari *et al* at Tohid Burn Center in Tehran, reported wound infection to be the main cause of nosocomial infection (7). Askarian *et al* also reported wound infection as the most common cause of nosocomial infection followed by BSI and UTI (13).

We described *P. aeruginosa* as a common cause of nosocomial infection. Similarly, Amin *et al* explained this pathogen as a common cause of nosocomial infection at Taleghani burn hospital (12). This is in agreement with prior reports from other parts of Iran (6,7). Furthermore, the frequency of *P. aeruginosa* infection has increased during the recent years in our center.

It is worth to note that we report, for the first time, the high frequency (58%) of MRSA at Taleghani burn hospital. This pathogen has been reported as a major cause of nosocomial infection in Europe (14,15).

The control of emergence and spread of antimicrobial resistance among the most common human bacterial pathogens is probably one of the most important challenges for scientific and medical communities. Burn isolates are the best candidates for the study of pathogenic bacterial species, in particular, those that are responsible for human colonization such as *P. aeruginosa* and *S. aureus*.

In conclusion, nosocomial infections in burn patients are most commonly occurred with *P. aeruginosa* and *S. aureus*. Our results may pave the way for providing useful guidelines to choose effective empiric antimicrobial therapy against multi-drug resistant *P. aeruginosa*, *A. baumannii* and MRSA isolated from burn patients. Furthermore, a nosocomial infection surveillance system should be introduced and staff must be educated in this regard.

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