

# BURN

## Nosocomial Infection in Burn Unit of Cipto Mangunkusumo Hospital, Jakarta

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**Backgrounds:** Burn patients, due to the immune compromise effects of their injury have a high risk for infections. The major cause of infection is the hospital environment contamination. This study was conducted to detect and identify isolated bacteria from patients and hospital environment in the Burn Unit and determine their antibiotics pattern in response to commonly used antimicrobial agents; in order to give recommendations for management of bacterial infections and drug-resistance.

**Patients and Methods:** Retrospective observational study was conducted reviewing the database of Burn Unit in RSCM from January until December 2010. The characteristics of microorganisms found on the burn wound were compared to those obtained from the environments such as from the air, bathing water, and medical instruments. The pattern of microorganisms and their sensitivity-resistance characteristics were noted.

**Result:** The pattern shows that nosocomial infection in the Burn Unit of RSCM was high. *Klebsiella pneumoniae* found on the burn wound eschars mimics those obtained from the air within the Burn Unit. Strains of MRSA were also found on screening.

**Conclusion:** Our findings emphasize the need for careful disinfection and more strict infection control procedures in areas that serve immune suppression individual, such as burn patients.

**Keyword:** Nosocomial infection, Burn Unit, *Klebsiella pneumoniae*, MRSA

**Latar Belakang:** Pasien luka bakar memiliki resiko tinggi untuk terinfeksi. Penyebab utama infeksi yang terjadi adalah kontaminasi dari lingkungan sekitar rumah sakit. Penelitian ini bertujuan untuk mendeteksi dan mengidentifikasi bakteri yang diisolasi dari pasien dan lingkungan sekitar rumah sakit di unit luka bakar, dan menentukan pola antibiogram sebagai respon terhadap zat antimikroba, yang hasilnya akan dapat digunakan untuk direkomendasikan tatalaksana yang tepat terhadap infeksi bakteri serta resistensi yang mungkin timbul.

**Pasien dan Metode:** Studi observasi retrospektif digunakan untuk mengkaji ulang data pada unit Luka bakar dari Januari sampai Desember 2010. Karakteristik mikroorganisme yang ditemukan pada pasien dibandingkan dengan mikroorganisme yang ditemukan pada lingkungan rumah sakit, yaitu dari udara, air untuk mencuci, dan alat-alat kedokteran. Pencatatan dilakukan terhadap pola mikroorganisme yang ditemukan dan sifat resistensi serta sensitivitas terhadap antimikroba.

**Hasil:** Pola mikroorganisme menunjukkan infeksi nosokomial pada Unit Luka Bakar RSCM adalah tinggi. *Klebsiella pneumoniae* yang ditemukan pada eskar luka bakar sesuai dengan hasil yang didapat dari pemeriksaan terhadap udara di Unit Luka Bakar. Pada hasil screening ditemukan pula strain MRSA.

**Kesimpulan:** Hasil penelitian kami menunjukkan perlunya disinfektan yang benar, dan prosedur kontrol infeksi yang lebih ketat pada area yang melayani pasien dengan daya tahan tubuh yang rendah contohnya pada pasien luka bakar.

Infection is the most common cause of death following burn injury. Burn patients are at a high risk for infection as a result of the nature of the burn injury itself, the immune compromise effects of burns, prolonged hospital stays, intensive diagnostic and therapeutic procedures. In addition, control and prevention of infectious diseases among burned

patients present a greater and more specialized problem due to disrupted of the skin barrier and the environment in Burn Units that might contaminated with resistant organisms. These organisms can easily transmit from one patient to another. Those burn cares units can be the site of explosion and prolonged outbreaks caused by resistant organisms.<sup>1,2</sup>

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Presented at the 15th Annual Scientific IAPS, Semarang, Central Java, Indonesia

**Disclosure:** The authors have no financial interest to disclose.

Although eradication of infection in burn patients is impossible, a well conducted surveillance, infection control and prevention program can help reduce the incidence. It is known that effective surveillance and infection control may reduce infection, mortality rates, and length of stay. It is common knowledge that the spectrum of infective agents varies from time to time and from place to place. Therefore, it is desirable to carry out periodic reviews of the bacterial flora of burn wound in order to modify preventive strategies as necessary<sup>3</sup>.

This study was conducted to detect and identify isolated bacteria from patients and hospital environment in the Burn Unit and determine their antibiotic pattern in response to commonly used antimicrobial agents; in order to give recommendations for management of bacterial infections and drug-resistance.

### PATIENTS AND METHODS

This study was carried out on burn patients that admitted to the Burn Unit Cipto Mangunkusumo Hospital, from January to December 2010. A total of 35 samples of swabs were processed from 35 admitted patients (27 males and 8 females) between 9–64 years old. The patients were followed to discharge or death. For estimation of burned areas, the Lund and Browder Total Body Surface Area (TBSA) scale was used.

All the patients received immediate care and resuscitation. The burn wounds of all patients were given Polyurethane film (Opsite) and/or Moist Exposure Burn Ointment (MEBO)

depends on the degree of burn wounds. Third-degree of burn is managed with Nanocrystal silversulfadiazine (Acticoat), early tangential excision and skin graft.

Depends on the judgement from PPIRS (Panitia Pengendali Infeksi Rumah Sakit) Ciptomangunkusumo Hospitals, systemic antibiotics, Amoxycillin-Clavulanic acid (Amoxyclav) were given initially to all admitted patients. Later, antibiotics were administered according to culture and sensitivity reports.

The sampling included swabs, was taken from clinically deep areas of burn wounds. The culture swabs for this study were taken on a third day after administered to the Burn Unit Cipto Mangunkusumo Hospital. Samples were quickly cultured on thioglycollate medium and blood agar in Department of Microbiology laboratory, University of Indonesia.

The microbial culture in the air, water, and instrumentation on the Burn Unit was taken as a sample. The data was taken from the previous research and from PPIRS (Panitia Pengendali Infeksi Rumah Sakit).<sup>4</sup>

### RESULTS

A total number of 35 patients (27 males and 8 females) were included in this study. The various types of bacteria isolated from burn wound culture are shown in Figure 1. The table clearly indicated that *Klebsiella pneumoniae* was the commonest bacteria that cause invasion of invasive burn wound, accounting for eight cases (23%), *Pseudomonas sp* causing 7 cases

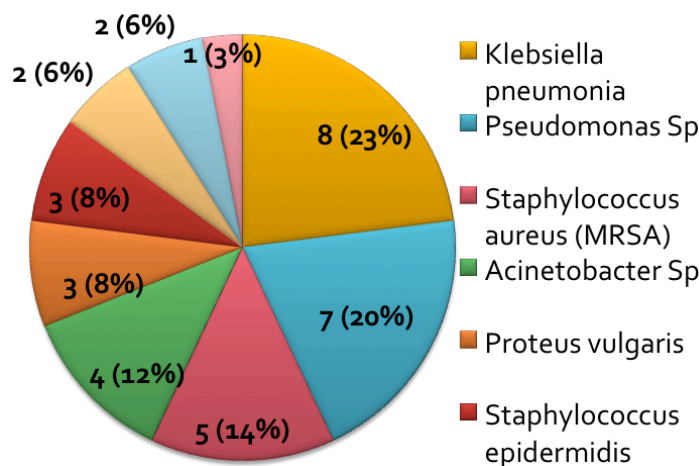
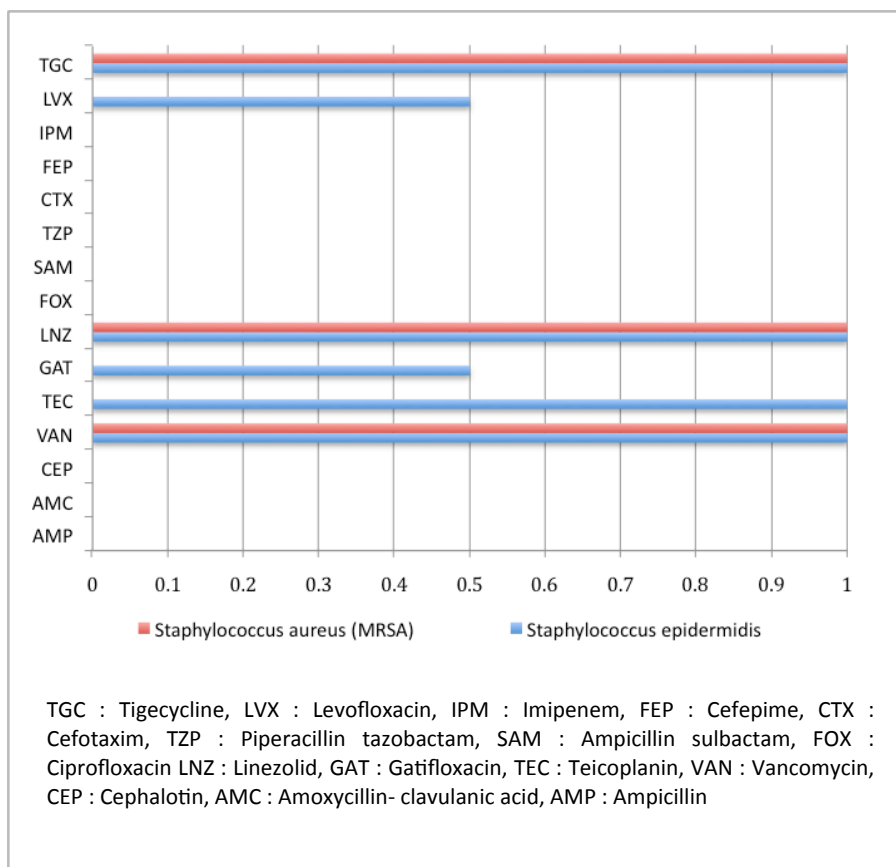


Figure 1. Antibiotic sensitivity of gram-positive organism in Burn Unit Cipto Mangunkusumo Hospital, 2010



**Figure 2.** Antibiotic sensitivity of gram-positive organism in Burn Unit Cipto Mangunkusumo Hospital, 2010

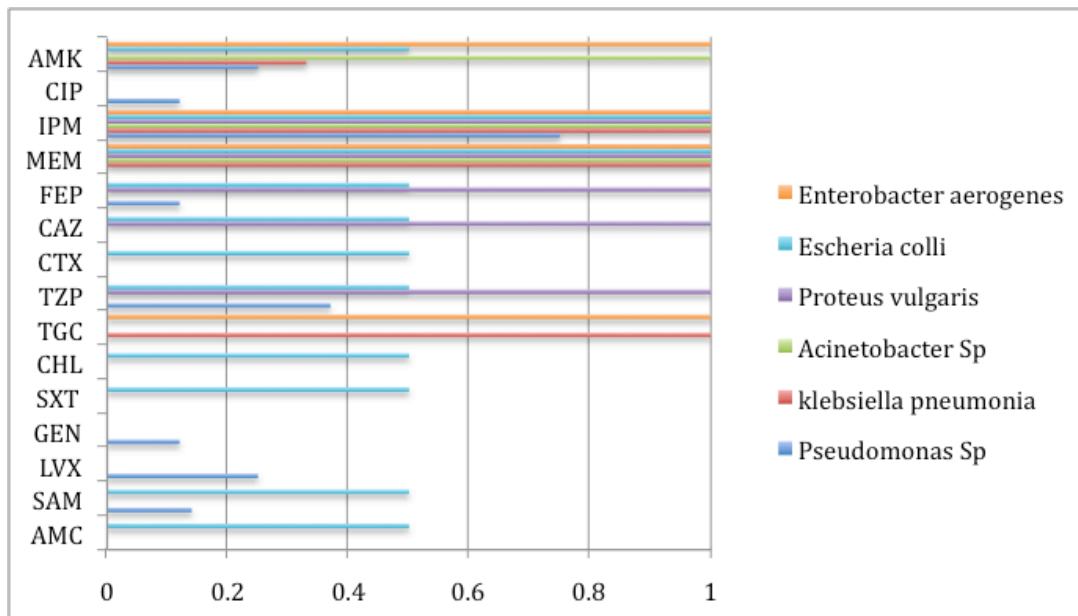
(20%) and *Staphylococcus aureus* (MRSA) for 5 (14%).

Gram-positive resistance: *Staphylococcus aureus* was completely resistant to Levofloxacin, Imipenem, Cefotaxim, Cephalotin and other antibiotics (0%). Vancomycin, Tigecycline and Linezolid has good sensitivity (100%), as shown in Figure 2. Gram-negative resistance: Only Meropenem and Imipenem, has good sensitivity to all gram negative bacteria as shown in Figure 3.

From the culture of the microbial in the air, *Klebsiella pneumoniae* is dominating, followed by *Staphylococcus aureus*, *Enterobacter sp*, *Acinetobacter sp*, and *Bacillus sp*. And from the water on the Burn Unit were founded *Pseudomonas aeruginosa*, *Citrobacter freundill* and *Bacillus sp*. *Citrobacter freundii* and *Bacillus sp* were found in the culture swab of the linen. There was no microbial founding in the instrument that used in Burn Unit (gloves and instruments).

## DISCUSSIONS

Wound infections are common problems in Burn Units, mostly originating from nosocomial contamination. The development of infections in burn cases is serious because of their effects on the course of the disease and patient outcomes.<sup>5,6</sup> Many burn patients die as a result of infection during their hospital courses. The rate of infection in burn cases is extremely high in developing countries.<sup>2,4</sup> This may be due to the prevalence of low-level socioeconomic groups of patients in whom poor hygienic conditions; malnutrition may also play a role in the earlier establishment of the infection. Inadequate measures to prevent cross-infection by Burn Unit workers and visitors are implicated. Poor compliance with hygiene rules and inadequate disinfection or sterilization of air conditioner, water in burn ward that can cause the spread of *Pseudomonas aeruginosa*, mattresses, bed sheets, dressing materials, and other equipment used for patient care, prolonged catherization, central/peripheral



AMK : Amikacin, CIP : Ciprofloxacin, IPM : Imipenem, MEM : Meropenem, FEP : Cefepime, CAZ : Caftazidime, CTX : Cefotaxim, TZP : Piperacillin tazobactam, TGC : Tigecycline, CHL : Chloramphenicol, SXT : Cotrimoxazole, GEN : Gentamycin, LVX : Levofloxacin, SAM : Ampicillin sulbactam, AMC : Amoxycillin-Clavulanic acid.

**Figure 3.** Antibiotic sensitivity of gram-negative organism in Burn Unit Cipto Mangunkusumo Hospital, 2010

lines, inefficient isolation of infected patients, decreased host resistance, and inappropriate antibiotic use are the most important causes for nosocomial infections in Burn Units.<sup>7,8</sup> Culture and sensitivity tests need to perform routinely in burn patients, to provide early identification of organisms colonizing the wound, to monitor the effectiveness of current wound treatment, to guide perioperative or empirical antibiotic therapy, or to detect any cross-colonization which occur quickly.

In the present study, the most commonly isolated organisms from burn patients in 2010 were *Klebsiella pneumonia* followed by *Pseudomonas sp* and Multi Resistant Staphylococcus Aureus (MRSA). The pattern of bacterial in our Burn Unit is in contrast to the other country's studies. Qader A.R et al, 2008 reported that *Pseudomonas sp* and *Klebsiella pneumonia* was dominated in nosocomial infection in Sulaimani Hospital Iraq. And also M. Imran et al, 2009 reported that *Pseudomonas sp* and *Staphylococcus aureus* have high

incidence in nosocomial infection in Burn Unit of Khyber Teaching Hospital Peshawar.

The major cause of the multi drug resistance is an inappropriate antibiotics or prolonged antibiotics consumption. And there was possibilities to the organisms that are resistant to one drug are likely to become resistant to others. Cross-resistance and genetic loci are important factors in this problem. The length of hospitalization is another factor to drug resistance in bacteria.

Although there were similarity between the culture swab of the wound and the microbial in the environmental Burn Unit, it could not conclude that the microbial in the wound were coming from the environment. It is need to check the strain of microbial from the wound and the environment. But these findings indicated failure to prevent cross-transmission in our Burn Unit. The lack of disinfection and hygiene of environmental Burn Unit, lower barrier staff and nursing, and also bad-regulated microbiological analysis of the environment, staff and burn patients were key

factors of the lower prevention of the nosocomial infection in our Burn Unit.

### CONCLUSION

Our findings emphasize the need for careful disinfection and more strict infection control procedures in areas that serve immunosuppressed individuals, such as burn patients.

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