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Case Report

Bacteriological Profile of Burn Wound Infections - A Cross Sectional Study

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Abstract

Burns are one of the most common and devastating forms of trauma. Patients with serious thermal injury require immediate specialized care in order to minimize morbidity and mortality. Data from the National Center for Injury Prevention and Control in the United States show that approximately 2 million fires are reported each year which result in 1.2 million people with burn injuries. The present study, "Bacteriological profile of burn wound infections" was carried out in Department of Microbiology, in a tertiary care hospital, over a period of one year from Jan 2016 – Dec 2016. A total of 50 patients of all age groups and both sexes admitted in our Burn Care Unit were selected for this study. In the present study, Majority of patients were in the age group 31-40years. Out of 50 patients studied, 28 patients were male and 22 patients were females. A total of 128 organisms were isolated and Pseudomonas aeruginosa (44 cases) was the most common isolate followed by Staphylococcus aureus (37 cases) and coagulase negative staphylococci (29 cases). The other isolates included Klebsiella pneumonia, Escherichia coli, Proteus mirabilis, Citrobacter freundii and Enterococcus species. Modern infection control practice has been effective in reducing or eliminating endemic pathogenic and/or antibiotic-resistant organisms, preventing the establishment of newly introduced pathogenic and/or antibiotic-resistant organisms as the predominant nosocomial flora of the burn unit, and preventing reseeding of such strains back into the burn unit from patients housed in the adjacent convalescent ward.

Keywords: Bacteria, burns, infection, Staphylococcus aureus.

INTRODUCTION

Burns are one of the most common and devastating forms of trauma. Patients with serious thermal injury require immediate specialized care in order to minimize morbidity and mortality. Data from the National Center for Injury Prevention and Control in the United States show that approximately 2 million fires are reported each year which result in 1.2 million people with burn injuries. Moderate to severe burn injuries requiring hospitalization account for approximately 100,000 of these cases, and about 5,000 patients die each year from burn-related complications. In Canada, the estimated numbers of burn victims and deaths in serious cases are proportionally smaller on a per capita basis.

The survival rates for burn patients have improved substantially in the past few decades due to advances in modern medical care in specialized burn centers. Improved outcomes for severely burned patients have been attributed to medical advances in fluid resuscitation, nutritional support, pulmonary care, burn wound care, and infection control practices. As a result, burn-related deaths, depending on the extent of injury, have been halved within the past 40 years. In patients with severe burns over more than 40% of the total body surface area (TBSA), 75% of all deaths are currently related to sepsis from burn wound infection or other infection complications and/or inhalation injury [1].

Burn wounds are prone to infection due to destruction of the skin barrier and concomitant depression of local and systemic immune responses. Also the burn wound surface provides a favorable niche for microbial colonization and proliferation, while the avascularity of the eschar causes impaired migration of host immune cells, restricts delivery of systematically administered antimicrobial agents and releases toxic substances that impair host immune response [2]. The risk of infection is directly proportional to the extent of injury and continues to be the predominant determinant for outcome in thermally injured patients [6]. It is also influenced by depth of the injury and age of the patients. Infections are less likely to be invasive in

partial thickness burns, they occur with greater frequency in children and elderly. The colonizing microorganism and its invasive potential also influence the risk of infection [3].

The organisms responsible for infections in patients who suffer from burn injuries may be endogenous or exogenous which can change over time in the individual patient[4]. Typically, the burn surface is sterile immediately following thermal injury, but after 48 hours the wound is colonized with skin commensals. After one week or so, the wounds become colonized with organisms from the host's gastrointestinal or respiratory tracts or from the hospital environment. This colonization, if uncontrolled may progress to invasion with systemic complications and death [5]. The most commonly recovered pathogens depend on the site of burn wounds and reflect the hospital's nosocomial pathogens. Although, Streptococcus pyogenes was the predominant pathogen in the pre- antibiotic era, it has been replaced with Staphylococcus aureus, Pseudomonas aeruginosa, Proteus mirabilis & Klebsiella pneumoniae [6].

Data on burn victims are limited in this part of the nation [7] and therefore the present study was undertaken to acquire a clear picture of the bacteriological spectrum of infection of burns in our burn care unit and their anti-microbial sensitivity pattern for proper appraisal of the problem and institution of suitable therapy and control.

OBJECTIVES

To study the bacteriological profile of burn wound infections.

METHODOLOGY

The present study, "Bacteriological profile of burn wound infections" was carried out in Department of Microbiology, DR B R AMBEDKAR MEDICAL COLLEGE, BENGALURU, over a period of one year from Jan 2016 – Dec 2016. A total of 50 patients of all age groups and both sexes admitted in our Burn Care Unit were selected for this study.

Sample Collection

The area around the burn wound was cleaned with 70% ethyl alcohol and the sample was collected from the depth of the wound using two sterile cotton swabs. The sample was transported immediately to the laboratory for further processing. Samples were collected immediately after the patients were admitted to the burns unit and every week thereafter until discharge or death of the patient.

RESULTS

Table-1: Age and Sex wise distribution of cases

Age group (years)	Male		Female		Total	
	No.	%	No.	%	No.	%
11-20	03	06	01	02	04	08
21-30	06	12	04	08	10	20
31-40	09	18	06	12	15	30
41-50	05	10	05	10	10	20
51-60	02	04	04	08	06	12
61-70	01	02	01	02	02	04
>70	02	02	01	02	03	06
Total	28	50	22	50	50	100

Majority of patients were in the age group 31-40years. Out of 50 patients studied, 28 patients were male and 22 patients were females.

Table-2: Frequency of organisms isolated from burn wounds at different weeks

Organism	1st week	2nd week	Total
P. aeruginosa	26	18	**44**
S. aureus	25	12	**37**
CONS	19	10	**29**
K. pneumoniae	2	3	**5**
E. coli	4	1	**5**
P. mirabilis	3	1	**4**
C. freundii	1	1	**2**
Enterococcus sp	1	1	**2**
Total	**81**	**47**	**128**

A total of 128 organisms were isolated and Pseudomonas aeruginosa (44 cases) was the most common isolate followed by Staphylococcus aureus (37 cases) and coagulase negative staphylococci (29 cases). The other isolates included Klebsiella pneumonia, Escherichia coli, Proteus mirabilis, Citrobacter freundii and Enterococcus species. Among 44 isolates of Staphylococcus aureus, 9 we're resistant to cefoxitin and we're identified as Methicillin resistant staphylococcus aureus.

DISCUSSION

In the present study, Majority of patients were in the age group 31-40years. Out of 50 patients studied, 28 patients were male and 22 patients were females.

According to Sadeghi-Bazargani H *et al*., the average age of the patient varies from 19 to 35 in the different studies they reviewed. Similar results were seen by Chakraborty S et al who reported that 56.6% of the cases were of 20-39 years age. Likewise, Jaiswal AK et al stated that most of the cases were between 21 – 30 years of age [8-10].

A total of 128 organisms were isolated and Pseudomonas aeruginosa (44 cases) was the most common isolate followed by Staphylococcus aureus (37 cases) and coagulase negative staphylococci (29 cases). The other isolates included Klebsiella pneumonia, Escherichia coli, Proteus mirabilis, Citrobacter freundii and Enterococcus species.

In the present study, Pseudomonas aeruginosa was the most common isolate in burn patients. These results were similar to results from other studies. In contrast, some other reports indicated a decrease in burn wound colonization with P. aeruginosa. It has been opined that with the advent of antibiotics against Gram positive organisms a significant rise in Pseudomonas infection of burned patients had occurred. Prevalence of Pseudomonas species in the burn wards maybe due to the fact that the organism thrives in a moist environment [11-13].

The second most common isolate was Staphylococcus aureus, again similar to reports from other studies. This is in contrast, however to some other studies especially from developed countries which report S. aureus as the most predominant organism in burn patients. Staphylococcus was the predominant cause of burn wound infection in the preantibiotic era and remains an important pathogen at present. However, Srinivasan S et al stated that the percentage incidence of staphylococci is on the decline from 2002 – 2005.

The study revealed that the main source of burns was gas flames (66%) and scalds (28%). Out of the 50 samples analysed, 86% were culture positive and 14% were culture negative for bacteria. The predominant organisms isolated were Pseudomonas sp. (30.2%) and Acinetobacter sp. (20.9%). Proteus mirabillis (2.3%) and Staphylococcus aureus (2.3%) were the least frequently isolated bacteria. Although Pseudomonas sp. showed varying resistance levels to gentamicin, cotrimoxazole and ciprofloxacin, all the Acinetobacter sp. were resistant to most of the tested antibiotics used. Resistant gram negative bacteria are the most common isolates associated with burn wounds in Accra, Ghana. Hence a careful selection of antibiotics to control the wound infection is required for proper management of burn wounds in order to help reduce morbidity and mortality [14].

The study revealed that bacterial infection at least once reached 100% by the end of the 4th week of admission. Staphylococcus aureus, Klebsiella pneumoniae and coagulase negative Staphylococci were the most frequently isolated organisms, each representing 20.2%, followed by Pseudomonas aeruginosa 14.6% and E. coli 10.1%. Fungi were found to cause burn wound invasion late during the second week post burn, with the highest incidence during the fourth week, reaching 36% by the end of the 4th week of admission Candida spp (66.7%). The susceptibility pattern of 745 bacteria isolated against 20 antimicrobial agents. All strains were susceptible to all antibiotic; resistance was observed in some strains [15].

CONCLUSION

Modern infection control practice has been effective in reducing or eliminating endemic pathogenic and/or antibiotic-resistant organisms, preventing the establishment of newly introduced pathogenic and/or antibiotic-resistant organisms as the predominant nosocomial flora of the burn unit, and preventing reseeding of such strains back into the burn unit from patients housed in the adjacent convalescent ward. The infection control program for burn centers requires strict compliance with a number of environmental control measures that include strictly enforced hand washing and the universal use of personal protective equipment (i.e., gowns, gloves, and masks). Health care personnel must be gowned (including use of disposable or reusable gowns and disposable plastic aprons to prevent soiling of health care workers' clothing during wound care procedures) and gloved at each entry to the burn patient's isolation room. Monitoring and diagnostic equipment is housed in each burn patient's room to prevent cross-contamination between patients. All equipment in the isolation room must be regularly cleaned with appropriate disinfectants. Procedures that may predispose burn patients to cross-contamination, such as exposure hydrotherapy, are kept to a minimum.

REFERENCES

1. Mandell, G., Dolin, R., & Bennett, J. (2010). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (No. Ed. 7).

USA: Churchill Livingstone Elsevier.
2. Sharma, M., & Taneja, N. (2007). Burns, antimicrobial resistance and infection control. *Indian Journal of Medical Research*, 126:505-507.
3. Bennett, J. V., Jarvis, W. R., & Brachman, P. S. (Eds.). (2007). *Bennett & Brachman's hospital infections*. Lippincott Williams & Wilkins.
4. El Morsi, H. A. R. (1990). The diagnosis and treatment of infection in the burn patient. *Annals of the MBC*, 3(1):1-5
5. Rafla, K., & Tredget, E. E. (2011). Infection control in the burn unit. *Burns*, *37*(1), 5-15.
6. Al-Arfaj, A. L., Twum-Danso, K., Hegazi M., & Magbool, G. (1990). Burn wound infection. *Indian Journal of Surgery*, 52(6), 271-275.
7. Ganesamoni, S., Kate, V., & Sadasivan, J. (2010). Epidemiology of hospitalized burn patients in a tertiary care hospital in South India. *Burns*, *36*(3), 422-429.
8. Sadeghi-Bazargani, H., & Mohammadi, R. (2012). Epidemiology of burns in Iran during the last decade (2000–2010): review of literature and methodological considerations. *Burns*, *38*(3), 319-329.
9. Chakraborty, S., Bisoi, S., Chattopadhyay, D., Mishra, R., Bhattacharya, N., & Biswas, B. (2010). A study on demographic and clinical profile of burn patients in an Apex Institute of West Bengal. *Indian journal of public health*, *54*(1), 27-29.
10. Jaiswal, A. K., Aggarwal, H., Solanki, P., Lubana, P. S., Mathur, R. K., & Odiya, S. (2007). Epidemiological and socio-cultural study of burn patients in MY Hospital, Indore, India. *Indian Journal of Plastic Surgery*, *40*(2), 158-163.
11. Bairy, I., & Shivananda, P. G. (1997). Aerobic bacterial flora of burn wound infection. *Indian J Surg*, *59*, 215-218.
12. Nagesha, C. N., Shenoy, K. J., & Chandrashekar, M. R. (1996). Study of burn sepsis with special reference to Pseudomonas aeruginosa. *Journal of the Indian medical association*, *94*(6), 230-233.
13. Ozumba, U. C., & Jiburum, B. C. (2000). Bacteriology of burn wounds in Enugu, Nigeria. *Burns*, *26*(2), 178-180.
14. Forson, O. A., Ayanka, E., Olu-Taiwo, M., Pappoe-Ashong, P. J., & Ayeh-Kumi, P. J. (2017). Bacterial infections in burn wound patients at a tertiary teaching hospital in Accra, Ghana. *Annals of burns and fire disasters*, *30*(2), 116-120.
15. Al-Aali, K. Y. (2016). Microbial profile of burn wound infections in burn patients, Taif, Saudi Arabia. *Arch Clin Microbiol*, *7*(2), 1-9.