

A RETROSPECTIVE STUDY OF ANTIBIOGRAM IN ONE OF THE LARGEST BURN CENTER IN PAKISTAN

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Abstract

Background and Objective: Jinnah Burn and Reconstructive Surgery Center, Lahore, Pakistan is one of largest burn patients management center in country. We evaluated our latest antibiogram of burn wounds to help patients and improve the healthcare.

Methods: Retrospective observational study of burn patients. Our study included all kinds of burns and all admitted patients with all ages, total burn surface area 01-80%. Wound cultures and sensitivity done on wounds swabs by culture and disc diffusion methods.

Results: There were 175 cases. Total six bacteria were found in all 175 cases. The *Acinetobacter* species were 9 (5.1%), *Klebsiella* species were 110 (62.8%) and these were most common ones, *Proteus* species were 12 (6.8%), *Pseudomonas* species were 30 (17.1%), *Staphylococcus aureus* were 12 (6.8%) and *Staphylococcus coagulase negative* were 2 (1.1%). *Klebsiella* was most sensitive to Colistin. All 105 out of 105 were sensitive (100.0%), followed by Tigercyclin; 39 out of 65 were sensitive (60.0%) and then Meropenem 47 out of 88 were sensitive (53.4%).

Conclusion: *Klebsiella* is the most common organism found in cultures of burn wounds and Colistin shows best sensitivity results against all bacteria found in our reports including *Klebsiella*.

Keywords: antibiogram, burn wounds, colistin sensitivity, burn centers.

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The skin is an essential component of the non-specific immune system, protecting the host from potential pathogens in the environment.¹ Thermal burns are burn to the skin caused by any external heat

source commonly caused by flame; other types of burn include radiation burns, chemical burns and electrical burns.^{1,2} Burns are a global public health problem, accounting for an estimated 180,000 deaths annually.³ Non-fatal burns are a leading cause of morbidity, including prolonged hospitalization, disfigurement and disability, often with resulting stigma and rejection.⁴ The injury represents an assault on all aspects of the patient, from the physical to the psychological.⁴

The burn wound represents the susceptible site for nosocomial and opportunistic pathogenic infections and is the leading cause of morbidity and mortality.⁵ Bacterial infections in burn patients are widely reported, and the change of normal flora from gram-positive to gram-negative types of bacteria is usually noticed within 4 to 10 days after hospitalization.⁶

The immune-compromising effects of burns, especially in patients who stay in the hospital for a long time and may be subjected to endotracheal intubation, blood

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vessel and bladder catheterization, or air and other environmental contaminants, put such patients at a high risk of infection.^{6,7}

The pathogens that infect the wound are primarily gram-positive bacteria such as *Staphylococcus aureus* and gram-negative bacteria such as *Acinetobacter baumannii-calcoaceticus* complex, *Pseudomonas aeruginosa*, and *Klebsiella* species.⁸

The burn patients have unique predisposition to different infections which are linked to impaired resistance from disruption of the skin's mechanical integrity and generalized immune suppression. The skin barrier is replaced by a protein rich, avascular environment that provides a favorable niche for microbial colonization and proliferation. Additionally migration of immune cells is hampered, which contributes to septic process.⁹⁻¹³ It was shown that approximately 73 per cent of all death within the first five days post-burn has been caused by sepsis¹⁴⁻¹⁶. Antibigrams show the cultures and their sensitivity to antimicrobials. Antibigrams are always changing due to bacterial resistance.

So, the aim of our study was to determine the most common microorganisms and their susceptibility patterns at Jinnah Burn and Reconstructive Surgery Center, Lahore. It is one of largest burn center in Pakistan with, a total of 78 beds, including 10 ICU beds. It is affiliated with Allama Iqbal Medical College, Lahore. It has an emergency and an outdoor patient department admitting patients with all ages. All sort of burn patients are treated including flame burn, high voltage electric burn, and low voltage electric burns, cold burns, contact burns, chemical burns which are more common in young age group,¹⁷ friction burns which are mostly caused by road side accidents¹⁸ and scald burns with most affected age group is preschool age.¹⁹ At this center we send first culture and sensitivity of wound swabs of all admitted patients on 3rd day of admittance. It is necessary for burn units to make an antibiogram for burn patients, from time to time due to ever changing sensitivity of antimicrobials.²⁰

METHODS

Patients were with burns admitted in Jinnah Burn and Reconstructive Surgery Center Lahore with all ages, both genders and total burn surface areas range from 1% to 80%, needing surgical management or ICU care or both. Surgical management includes wound excision, skin grafting, fasciotomies or skin flaps. ICU care is given to critical patients with more than 40% total burn surface area or any amount of total burn surface area along with inhalational injury or high voltage electric burn.

All culture and sensitivity reports of all those patients were included meeting inclusion criteria but not falling in exclusion criteria.

Age, gender, mode of burn injury and percentage burns were noted from the history on patient files or database software named Hospital Information Management System (HIMS) used in our center.

Technique:

Technique of wound swab is as, we take sterilized culture sticks and touch swab part of them to the wound thoroughly until it gets wet with moisture/purulent discharge from the wound. Culture sticks are sent to the lab immediately after labeling.

At our laboratory we culture the Bacteria. Wound swabs were cultured on Blood, McConkey and Cysteine Lactose Electrolyte Deficient Agars. Later isolates were Gram stained. Identification of genus is done but species are generally not identified.

Then sensitivity is checked by antibiotic disc diffusion methods.

Exclusion Criteria:

Drugs checked with less than 5 samples were excluded from our study.

The burn patients with more than 80% total burn surface areas are excluded from our study.

All those patient who died before first wound swab (on or before third day of burn injury) for culture and sensitivity test were excluded.

Sampling:

Consecutive sampling technique was used

RESULTS

Among 175 cases 66 (37.7%) were females and 109 (62.3%) were males. Age ranged from 02-90 years with mean age 26.38 years. Total burn surface areas ranged 01-80% percent of body surface with mean of 20.65% of body surface of patients.

Modes of burn were, flame burn 94 (53.7%), high voltage electric burn 40 (22.9%), scald burn 18 (10.3%), contact burn 7 (4.0%), low voltage electric burns 6 (3.4%), chemical burns other than acid 5 (2.9%), acid burns 2 (1.1%), friction burn 2 (1.1%), and cold burn 1 (0.6%).

Total six bacteria were found in all 175 culture reports. The *Acinetobacter* species were 9 (5.1%), *Klebsiella* species were 110 (62.8%) and these were most common ones, *Proteus* species were 12 (6.8%), *Pseudomonas* species were 30 (17.1%), *Staphylococcus aureus* were 12 (6.8%) and *Staphylococcus coagulase* negative were 2 (1.1%).

Klebsiella species being most common in our study were studied against each antibiotic available and we found in sensitivity of drugs separately for *Klebsiella* species.

Amoxi Clav 8 out of 73 were sensitive (10.9%), Ampicillin Sulbactam combination showed 5 out of 63 were sensitive (7.9%), Amikacin 25 out of 51 were sensitive (49.0%), Cefotaxim 3 out of 20 were sensitive (15.0%), Cefepime 9 out of 30 were sensitive (30.0%),

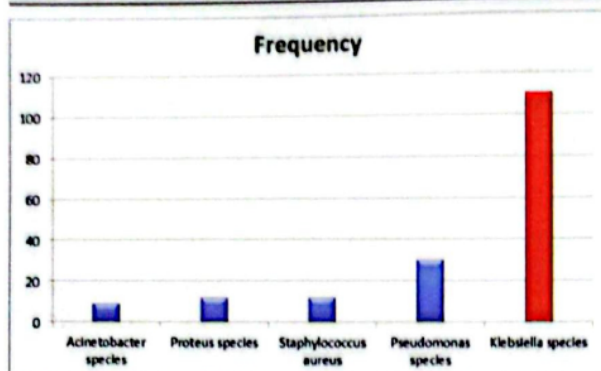
Cefoparazone 40 out of 87 were sensitive (45.9%), Ceftriaxone 2 out of 36 were sensitive (5.5%), Ciprofloxacin 15 out of 51 were sensitive (29.4%), Colistin all 105 out of 105 were sensitive (100.0%), Ceftriaxone 3 out of 17 sensitive (17.6%), Gentacin 47 out of 95 were sensitive (49.4%), Levofloxacin 10 out of 51 were sensitive (19.6%), Meropenem 47 out of 88 were sensitive (53.4%), Piperacillin tazobactam combination 37 out of 91 were sensitive (40.6%), Tigercyclin 39 out of 65 were sensitive (60.0%).

DISCUSSION

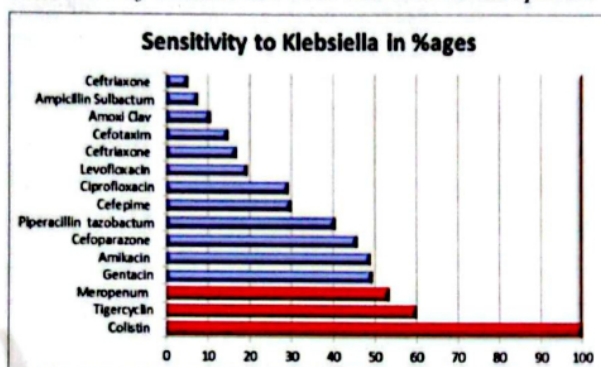
Our study clearly shows that prevalence of gram positive bacteria are not as common as they thought to be among burn patients. The most common pathogens were gram negative bacteria and sole *Klebsiella* species count is more than all other bacteria combined in these culture reports. (Graph I) In this era of burn wounds management we are fighting with *Klebsiella* species. Unfortunately there is a high resistance to this and other bacteria in our sensitivity reports. Meropenem, Tigercyclin and Colistin are only three drugs showing more than 50% sensitivity to *Klebsiella* species in our study. Colistin is a promising drug that showed 100% sensitivity to *Klebsiella* and other gram negative bacteria as well. (Graph II) Colistin should be preserved and used with caution to prolong the duration of development of its resistance in these bacteria.

Table 1: The Table shows the Actual Results in Number (n) and Percentages (%) of Results Against all Kinds of Bacteria Found in the Reports

Antibiotic	Results found with this antibiotic	Resistant n (percentage)	Sensitive n (percentage)	Total n (cumulative percentage)	Sensitivity more than 50% bacteria?
Amikacin	90	41 (45.6%)	49 (54.4%)	90 (100%)	Yes
Amoxi clav	120	106(88.3%)	14 (11.7%)	120 (100%)	No
Ampicillin	13	13 (100%)	0 (00.0%)	13 (100%)	No
Ampicillin-Salbactam	89	78(87.6 %)	11 (12.4%)	89 (100%)	No
Cefoparazone-Sulbactam	127	59(46.5 %)	68 (53.5%)	127 (100%)	Yes
Cefotaxime	28	23(82.1 %)	5 (17.9%)	28 (100%)	No
Cefoxitin	12	7(58.3 %)	5 (41.7%)	12 (100%)	No
Ceftazadime	27	17(63%)	10 (37%)	27 (100%)	No
Ciprofloxacin	73	50(68.5 %)	23 (31.5%)	73 (100%)	No
Colistin	141	0 (00.0%)	141 (100%)	141 (100%)	Yes
Erythromycin	12	6(50 %)	6(50 %)	12 (100%)	Yes
Gentamicin	144	79(54.9%)	65 (45.1%)	144 (100%)	No
Levofloxacin	74	54(73 %)	20 (27%)	74 (100%)	No
Meropenem	124	59(47.6 %)	65(52.4%)	124 (100%)	Yes
Piperacillin-Tazobactam	137	67(48.9 %)	70 (51.1%)	137 (100%)	Yes
Tigecycline	72	29(40.3 %)	43 (59.7%)	72 (100%)	Yes



Graph I: Shows frequency of bacteria in cultures obtained from burn wounds. The bacteria with more than 50% of isolates are red. The *Klebsiella* species



$n=110$ and is as common as 62.8% of all reports.

Graph II: Shows sensitivity of *Klebsiella* species in particular found in burn patient wounds with multiple antibiotics. The antibiotics with proved more than 50% sensitivity are red and Colistin is the only drug which shows 100% sensitivity to this bacteria. While the Tigercyclin and Meropenem shows more than 50% sensitivity to this bacteria.

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