



BURN WOUND INFECTION AND ANTIBIOTIC SUSCEPTIBILITY PATTERNS IN A TERTIARY CARE TEACHING CENTRE IN WESTERN INDIA

Plastic Surgery

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ABSTRACT

BACKGROUND: Invasive burn wound sepsis is the leading cause of death in burn victims. Antibacterial susceptibility patterns for micro-organisms isolated from the hospitalized burn patients are continuously evolving.

METHODS: A cross-sectional study was performed by analysing consecutive, nonrepeat clinical samples of all burn patients admitted in a tertiary care referral burn centre and teaching hospital, over a period of one year. All patients were initially resuscitated and optimized on standard management protocols. Patients were actively followed up, and relevant samples (wound swab, blood and urine) from burn patients were collected aseptically. Samples were examined by standard microbiological techniques.

RESULTS: Out of a total of 81 isolates, 33 were *Pseudomonas aeruginosa* (40.74%) as the most frequent isolate, followed by 21 *Acinetobacter* (25.92%), 15 *Klebsiella pneumoniae* (18.51%), 4 *Staphylococcus aureus* (4.93%), 4 *Enterococcus faecium* (4.93%), 1 *E. coli* (1.23%), 1 *Staphylococcus hemolyticus* (1.23%), 1 *Burkholderia cepacia* (1.23%) and 1 *Proteus mirabilis* (1.23%). Positive cultures were significantly more frequent among patients with over two weeks duration of burn wounds. We found a greater number of positive isolates in the second week of burn duration (n=28;35% of total isolates). Maximum number of isolates were susceptible only to colistin and tigecycline (n= 68; 84%). We found that most of the organisms were resistant to rest of the antibiotics.

CONCLUSION: *Pseudomonas*, *Acinetobacter* and *Klebsiella* were the commonest isolate in burns at our centre, which were more frequent with over two weeks of burn duration. Colistin and tigecycline was the antibiotic sensitive to most of the isolates.

KEYWORDS

Invasive burn wound sepsis, antibiotic sensitivity, burn wound infection

INTRODUCTION

Burn wound infection is the most annoying complication faced by care-givers across the globe, despite of all advancements in identification of responsible organisms and availability of newer susceptible antibiotics.¹ Invasive burn wound sepsis is the leading cause of death in burn victims. ² WHO factsheet data on burns estimates that direct cost for care of burn victims in USA is more than US\$ 211 million.³ This economic burden is crippling for a developing country like India, where over 10,00,000 people are moderately or severely burnt every year.³ For the treatment of invasive burn wound sepsis, knowing susceptibility pattern of bacteria to antibiotics, is of paramount importance.⁴ Antibacterial susceptibility patterns for micro-organisms isolated from the hospitalized burn patients are continuously evolving.⁵

There was a dearth of data with respect to prevalent micro-organisms responsible for invasive burn wound sepsis and their antibiotic susceptibility profile at our burn center. Thus, we designed a study with an aim to look for susceptibility patterns of the bacteria grown in our burn center based on bacteriological cultures. This objective of this study was to guide us in framing antibiotic policy of our burn center.

METHODOLOGY

A cross-sectional study was performed by analysing 81 consecutive, nonrepeat clinical samples of all burn patients admitted in a tertiary care referral burn centre and teaching hospital, over a period of 12 months from 24 Feb 2017 to 26 Feb 2018. Informed consent from all patients and clearance from the Institutional Ethics Committee was obtained. The study included patients of both gender and all ages, who had sustained deep burns and underwent definitive management with wound excisions and skin grafting at our centre. All patients were initially resuscitated and optimized on standard management protocols. Patients were actively followed up, and relevant samples (wound swab, blood and urine) from burn patients were collected aseptically. Samples were examined by standard microbiological techniques. The data with respect to micro-organism isolated and their antibiotic susceptibility pattern were reported as per CLSI guidelines.⁶ Data were tabulated and presented as results in tabular form.

RESULTS

Out of a total of 81 isolates, 33 were *Pseudomonas aeruginosa* (40.74%) as the most frequent isolate, followed by 21 *Acinetobacter*

(25.92%), 15 *Klebsiella pneumoniae* (18.51%), 4 *Staphylococcus aureus* (4.93%), 4 *Enterococcus faecium* (4.93%), 1 *E. coli* (1.23%), 1 *Staphylococcus hemolyticus* (1.23%), 1 *Burkholderia cepacia* (1.23%) and 1 *Proteus mirabilis* (1.23%) as shown in Table 1 and Fig 1. A variable antibiotic susceptibility pattern was observed among the grown microbes as shown in Table 2 and Fig 2. Positive cultures were significantly more frequent among patients with over two weeks duration of burn wounds.

Table 1 Organisms isolation pattern

Organism isolated	Burn duration and number of isolates				Total (%)
	Week 1	Week 2	Week 3	Week 4	
<i>Pseudomonas aeruginosa</i>	6	12	10	5	33 (40.74)
<i>Acinetobacter baumannii</i>	5	7	6	3	21 (25.92)
<i>Klebsiella pneumoniae</i>	2	6	3	4	15 (18.51)
<i>Enterococcus faecium</i>	2	0	1	1	4 (4.93)
<i>Staphylococcus aureus</i>	2	1	0	1	4 (4.93)
<i>E-coli</i>	1	0	0	0	1 (1.23)
<i>Staphylococcus hemolyticus</i>	0	1	0	0	1 (1.23)
<i>Burkholderia cepacia</i>	0	1	0	0	1 (1.23)
<i>Proteus mirabilis</i>	0	0	1	0	1 (1.23)
Total	18	28	21	14	81 (100)

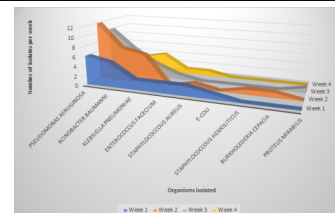


Figure 1 Organism profile based on burn duration

Table 2 Antibiotic susceptibility pattern

Antibiotic susceptibility	Burn duration			
	Week 1	Week 2	Week 3	Week 4
Colistin + tigecycline	14	22	19	13

Linezolid	2	3	0	1
Amikacin	2	0	1	0
Piperacillin + tazobactam	0	2	0	0
Meropenem	0	1	0	0
Augmentin	0	0	1	0
Total	18	28	21	14

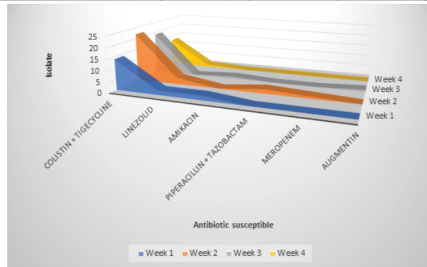


Figure 2 Antibiotic susceptibility profile based on burn duration

We found a greater number of positive isolates in the second week of burn duration ($n=28$; 35% of total isolates). Maximum number of isolates were susceptible only to colistin and tigecycline ($n=68$; 84%). We found that most of the organisms were resistant to rest of the antibiotics.

DISCUSSION

Pseudomonas aeruginosa was the most frequent organism isolated in our patients. Our finding conforms to many published studies which have reported *P. aeruginosa* as the commonest microbe cultured from burn wounds.⁷ In striking contrast to our finding, some published studies have reported *S. aureus* as their predominant microbe of bacterial burn wound infections.^{8,9}

Acinetobacter baumannii species constituted the second most frequently identified organism in our patients, conforming to published studies which have also reported it as the second commonest cultured microbe.¹⁰ We found *Klebsiella* as the third commonest isolate positive in our study, however other studies have reported *Klebsiella* species as the most common microbe in the bacteriologic profiles of their burn wounds.¹¹ In our study only four isolates had *S. aureus* grown, in contrast to study by William Norbury et al where *S. aureus* was the commonest isolate cultured from burn wounds.¹

A variable antibiotic susceptibility pattern was observed among the grown microbes. Majority of the isolates (84%) were sensitive only to colistin and tigecycline. The remaining isolates were resistant to all other antibiotics tested at our centre. Positive cultures were significantly more frequent among patients with over two weeks duration of burn wounds ($n=28$, 34.5%). Yasemin et al in their study concluded that growth of multidrug-resistant organisms is a serious risk in burn units.¹² We also found similar results in our study.

CONCLUSION

Aggressive infection control measure is required to limit the emergence and spread of multi-drug resistant organisms in burns centre. *Pseudomonas*, *Acinetobacter* and *Klebsiella* were the commonest isolate in burns at our centre which were more frequent with over two weeks of burn duration. Colistin and tigecycline was the antibiotic sensitive to most of the isolates. Based on our findings we recommend strict infection control measures, constant wound surveillance with regular sampling of tissues for quantitative culture, and early excision and grafting of wounds as the principal adjuncts to control the invasive infections in burn patients.

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Conflict of interest

No conflict of interest

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