

# WOUND INFECTIONS AND CULTURE SENSITIVITY PATTERN IN PEDIATRIC BURN PATIENTS

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## ABSTRACT

**Objective:** To identify common organisms causing burn infection and their antimicrobial sensitivity pattern.

**Material and Methods:** A retrospective study of sixty patients with burn wound infection was carried out at burn unit of Khyber Teaching Hospital Peshawar from September 2006 to August 2007. Children who received burn injuries with signs and symptoms of septicemia were included in this study.

Age, sex, percentage of burn wound and etiology of burn wounds was recorded. Culture and sensitivity tests were performed from burn wounds of those patients who were having fever and other features of septicemia by tissue culture of all patients (from infective sites) and their results were noted.

**Results:** Out of sixty patients, forty were male and twenty were female pediatric burn patients. The most frequent organism isolated was staphylococcus aureus (25%), followed by pseudomonas (21.6%). Other organisms included mix pseudomonas and staphylococcus aureus (23.5%), E-coli (13%), proteus (3%), Klebsiella (3%). All these organisms were resistant to most routine antibiotics.

**Conclusion:** This study highlights that staphylococcus aureus (25%) and pseudomonas (21.6%) are the most common organisms and cefoperazone/sulbactam and imipenem/cilastatin are the most effective empirical therapy in our setup.

**Key words:** Pediatric burn patients, wound infection, anti microbial sensitivity by tissue culture.

## INTRODUCTION

Infection of burn wounds is a serious problem leading to death<sup>1,21</sup> and needs critical care and monitoring of pediatric burn patients<sup>2</sup>. Infection in burns is one of the most important factors determining the prognosis of burn disease<sup>3</sup>. The incidence of burn wound infection is directly co related to the extent of burn .It is related to impaired resistance from disruption of skin's mechanical integrity and generalized immune suppression.

Burn wounds can be classified as cellulitis, which involves unburned skin at the margin of the burn or invasive wound infection, which is characterized by microbial invasion of viable tissue beneath the burn eschar.

The denatured protein of the burn eschar

provides nutrition for the organism. Avascularity places the organisms beyond the reach of host defense mechanism and systemically administered antibiotics. This constitutes a serious threat to the management of such patients.

Burn wound infections are largely hospital acquired and cross infection is very common<sup>4</sup>.

There is need to assess the pattern of bacterial pathogens responsible for the burn wound infection<sup>5</sup>. Diagnosis can be made from wound swabs and tissue culture<sup>6</sup>.

The infection of burn wounds with multiple organisms, with superadded problem of drug resistance, illustrates the need for a drug policy by the hospitals for burn patients. The isolated bacteria exhibited multiple resistance to antibiotics<sup>7</sup>. The results imply that antibiotics

**ETIOLOGY OF BURN WOUNDS**

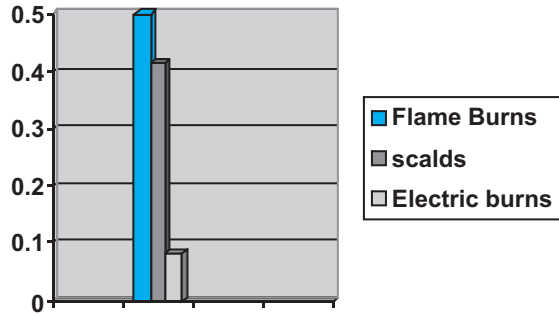


Figure 1

should be administered rationally in burn wards guided by the bacterial resistance pattern. Sepsis was better correlated to quantitative burn tissue biopsy cultures than surface swab cultures<sup>8</sup>. The escalation of antibiotic resistance continues worldwide, most prominently in patients in intensive care units. Antibiotic dosing must aim to address not only the bacteria isolated, but also the most resistant subpopulation in the colony, to prevent the advent of further resistant infections because of the inadvertent selection pressure of current dosing regimens. This may be achieved by maximizing antibiotic exposure by administering the highest recommended dose to the patient.<sup>8</sup>

**MATERIAL AND METHODS**

This retrospective study spanning over a period of one year from September 2006 to August 2007, was carried out at Burn unit of Khyber Teaching Hospital Peshawar. Age, sex, percentage

**TYPE AND PERCENTAGE OF ORGANISMS**

Type of organism	Number of patients	Percentage
Staphylococcus aureus	15	25%
Pseudomonas	13	21.6%
Staph.aureus+ pseudomonas	14	23.3%
E-coli	8	13.3%
Proteus	2	3%
Klebsiella	2	3%
Klebsiella+ E-coli	2	3%
Pseudomonas+ E-coli	2	3%
Streptococcus fecalis	1	1.6%
Enterobacter	1	1.6%

Table 1

of burns and etiology of burn wounds were recorded. Patient age 12 years and below, with sign and symptoms of septicemia were included in the study while patients with percentage of burns more than 65% were excluded from the study. Tissue cultures were taken for culture and sensitivity after doing closed dressings under general anesthesia, 2 parallel incisions about 1 cm and 1.5 cm apart from beneath the Escher were put in saline and immediately send to Khyber Teaching Hospital lab. The organisms isolated were noticed (growth more than 10<sup>7</sup>) and sensitivity pattern was recorded.

**RESULTS**

Total numbers of patients were sixty Age

**ORGANISMS' GROWTH AND THEIR SENSITIVITY TO VARIOUS ANTIBIOTICS  
2A SENSITIVITY OF STAPHYLOCOCCUS, PSEUDOMONAS AND E-COLI TO VARIOUS ANTIBIOTICS**

Antimicrobials	Staphylococcus aureas	Pseudomonas	E-Coli
Cefoperazone/sulbactam	100%	84%	88%
Cephradine	13%	80%	0%
moxifloxacin	100%	69%	NT
Meropenem	50%	76%	88%
Imipenem/cilastatin	50%	76%	88%
Amoxicillin/clavulanic acid	0%	0%	20%
Amikacin	26%	53%	62%
Ciprofloxacin	50%	69%	38%
Sparfloxacin	50%	NT	NT
Fucidin	100%	NT	NT
Enoxacin	NT	100%	NT
ceftriaxone	0%	NT	0%
ceftazidime	50%	76%	NT

\* NT- Not Tested

Table 2

**2B. SENSITIVITY OF PROTEUS TO VARIOUS ANTIBIOTICS**

Antimicrobials	Sensitivity
Cefoperazone/sulbactam	100%
Cephadrine	0%
ceftazidime	0%
moxifloxacin	50%
Meropenem	100%
Enoxacin	100%
Amoxicillin/clavulanic acid	20%
Ciprofloxacin	100%
Imipenem/cilastatin	100%
Amikacin	100%

Table 3

of patients with burns less than one year was 10, out of which 6 were male and 4 were female. Between 1 and 3 years of age, 8 were male and 4 were female patients. Maximum number of patients were between 3-6 years and were 20 in all, out of these 12 were male and 8 were female patients. 6-12 years age group included 18 patients. Out of which 14 were male and 4 were female.

The percentage of burns in Less than 1 year was between 25-60% While in 1-3 years age group it was 35-55%. In the 3-6 years age group it was found to be 20-45% While 6-12 years age group had 18-34% prevalence. Flame burns were most common in children in our study (50 %), followed by scalds (41.6%) and last were Electric burns (8.4%).

Growth of bacterial organisms and culture sensitivity pattern were recorded. The most common organism was staphylococcus, followed by pseudomonas. Other organisms included mixed staphylococcus aureus and pseudomonas, E-coli, Proteus, Klebsiella, Streptococcus and Enterobacter. The most effective antimicrobial includes, Cefoperazone/sulbactam, Imipenem/Cilastatin, ciprofloxacin, Enoxacin, moxifloxacin, Amikacin and Meropenem.

**DISCUSSION**

The Burn wound is considered one of major health problem in the world, and infection is one of the frequent and severe complications in patients who sustained burns<sup>9,10</sup>. The burn wound represents a susceptible site of opportunistic colonization by organisms of endogenous and exogenous origin<sup>10</sup>. Patient factors such as age, extent of injury and depth of burns in combination with microbial factors such as type and number of organisms, enzymes and toxin production and motility determine the likelihood of invasive burn wound infection<sup>11,12</sup>

Since over the last few decades the resistance pattern in burn patients has been showing dramatic changes<sup>13,14</sup> all over the world. It is therefore very important to identify the common infective organisms and their sensitivity for effective treatment of pediatric burn patients, since the role of prophylactic antibiotic in pediatric burn patients is controversial<sup>15</sup>.

In our study Staphylococcus was found to be the most common organism isolated during 1<sup>st</sup> week of pediatric burn patients (25%), followed by

**2C.SENSITIVITY OF KLEBSIELLA, STREPTOCOCCUS AND ENTEROCOCCUS TO VARIOUS ANTIBIOTICS**

Antimicrobials	Klebsiella	Streptococcus	Enterococcus
Cefoperazone/sulbactam	50%	100%	0%
Cephadrine	0%	0%	0%
Moxifloxacin	100%	100%	100%
Meropenem	100%	100%	100%
Imipenem/cilastatin	100%	100%	100%
Amoxicillin/clavulanic acid	0%	0%	0%
Amikacin	100%	100%	0%
Ciprofloxacin	100%	0%	100%
Sparfloxacin	100%	0%	100%
Ofloxacin	0%	0%	0%
Tazobactam/piperacillin	0%	100%	0%
Cefixime	0%	0%	0%
Ceftazidime	0%	0%	0%

Table 4

*Pseudomonas* (21.6%). This is in contrast to other studies which show *Pseudomonas* as the most common infective organism in pediatric burn patients.<sup>16, 17</sup>

Naser et al<sup>18</sup> from Cairo, Egypt has reported *Pseudomonas Aeruginosa* as the most frequent isolate (21.6%), followed by *Klebsiella pneumoniae* (15.2%) and *Staphylococcus* in only 11.6% of cases. Klaushi et al from Chandigarh, India have reported *Pseudomonas* as the most frequent isolates (54.2%) followed by *Staphylococcus aureus* (20.8%).

In our study most of organisms showed multi drug resistance. Cefoperazone /sulbactam, Meropenem, imipenem/cilastatin and Amikacin showed good sensitivity. The irrational use of antibiotics might be cause of high resistance.

According to Zhang<sup>19</sup> Sensitivity of *Pseudomonas* to ciprofloxacin, ceftazidime, and piperacillin were 92.9%, 91.5% and 78.3%, while for *Staphylococcus aureus* sensitivity rate was 88.9% to ciprofloxacin, 76.1 to ceftazidime, 71.4% to Amikacin, 48.5% to piperacillin and 63.1% to Cefuroxime. According to Atoyebi et al<sup>20</sup> the resistance of organism to most commonly used antibiotics like ampicillin, 15% of *Staphylococci* were sensitive to cloxacillin.

In another study conducted by Revathi et al<sup>21</sup> *Pseudomonas* was most susceptible to ceftazidime (83%) and cefoperazone (82%). Vancomycin was 100% effective in gram positive organisms. Most studies conducted in the world<sup>19,20</sup> shows that most common drugs are resistant to the organism isolated like ampicillin, erythromycin and Cephradine.

Our study has shown that most of organisms causing infection in pediatric burn patients are highly resistant to routinely used antibiotics. Antibiotics found to be highly effective include, Cefoperazone/sulbactam, imipenem/cilastatin, Meropenem and Amikacin. Other antibiotics which were effective include Ciprofloxacin, moxifloxacin, Fucidin and Enoxacin.

Advancements in resuscitation, surgical techniques, infection control (antibiotic coverage according to culture/sensitivity) and nutritional/metabolic support decreased mortality and morbidity<sup>21-22</sup>.

## CONCLUSION

This study highlights that *Staphylococcus aureus* and *Pseudomonas* are the most common organisms and cefoperazone/sulbactam and imipenem/cilastatin are the most effective

empirical therapy in our setup.

Antibiotics resistance due to inappropriate use of drugs is a common finding in our environment and medical staff must be educated regarding the rational use of antibiotics. Wound swabs should be performed in all cases and should be supplemented with tissue culture in cases of septicemia secondary to burn wounds.

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