

## Bacteriological Profile and Antibiogram of Isolates from Burn Ward in A Tertiary Care Hospital

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### Abstract

**Introduction:** Burn patients are at a risk of infection because of their destroyed skin barrier, suppressed immune system compounded by prolonged hospital stay and invasive therapeutic & diagnostic procedure. Despite various advances in infection control measures like early detection of causative agent and use of newer and broad spectrum antibiotics, management of burn septicemia still remains a big challenge. **Aim and Objective:** To study prevalence of various aerobic bacterial isolates among burn wound infection and to study their antimicrobial susceptibility pattern. **Material and Methods:** During study period of Jan- June 2017, a total of 369 pus samples were received and inoculated on different media as per standard protocol. Isolate were identified and antimicrobial susceptibility testing was done as per CLSI guidelines (2016). **Results and observation:** Out of 369 samples, 241 (65.31%) samples were from female and 128 (34.69%) from male. Among these 209 (56.64%) samples were having single isolate and in 125 (33.88%) samples, two types of bacteria were isolated. Out of 459 isolates, 133 Gram positive cocci and 326 Gram negative bacilli were isolated. Among various bacterial isolates *Pseudomonas aeruginosa* was most commonly isolated bacteria followed by *Staphylococcus* spp. and *Klebsiella pneumoniae*. Most of the isolates were resistant to routinely used antimicrobial agents. **Conclusion:** *P. aeruginosa* and *S. aureus* are the leading cause of infection in burn patients and isolation of multidrug resistant organism should be considered as a serious risk in burn unit. Early identification of infection caused by multidrug resistant organisms might help to modify treatment and outcome in burn patient.

**Keywords:** Burn Wound Infection; *P. Aeruginosa*; *S. Aureus* and Multidrug Resistance.

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### Introduction

Burn wound infection is one of the most common cause of morbidity and mortality [1]. Burn patients are at a risk of infection because of their destroyed skin barrier, suppressed immune system compounded by prolonged hospital stay and invasive therapeutic & diagnostic procedure [2].

It has been estimated that approximately 75%

of all death following burns are related to health care associated infections [3] which occurs due to infection by the organism of patients own flora, colonizers of the environment or from health care personnel [4]. Initially Gram positive organism derived from skin commensal colonize the wound bed, followed later by Gram negative organism and yeast. *Staphylococcus* spp. and *P.aeruginosa* are most frequently isolated microorganisms [5].

The pattern of infection differs from hospital to hospital and the bacterial flora of infected wound may change considerably during healing. Despite various advances in infection control measures like early detection of causative agent and use of newer and broad spectrum antibiotics, management of burn septicemia still remains a big challenge [6]. The worldwide emergence of antimicrobial resistance among wide variety of burn wound pathogen particularly health care associated isolates, limits the available therapeutic option for effective treatment of burn wound infection [7].

Therefore present study was undertaken to know the antimicrobial susceptibility pattern of various bacterial isolates recovered from burn patients which will help in instituting empirical therapy and minimize irrational use of antimicrobial agents.

#### Aim and Objectives

To study prevalence of various aerobic bacterial isolates among burn wound infection and to study their antimicrobial susceptibility pattern.

#### Material and Method

The study was done for a period of six month from Jan-June 2017. During six months period a total of 369 pus samples were received in the department of Microbiology from burn patients. Gram stain was done, followed by inoculation of the sample on blood agar and MacConkey agar [8]. The inoculated media were then incubated overnight at 37°C aerobically and identification of the organisms was done by Gram stain, colony morphology and biochemical reactions as per standard protocol [9]. The antimicrobial susceptibility testing was carried out by Kirby Bauer disc diffusion method according to Clinical Laboratory Standard Institute guidelines [10] (2016) using commercially available antimicrobial discs procured from Hi-Media Laboratories Pvt. Ltd.

#### Result and Observations

During a study period, a total 369 samples were received from burn patients, out of which 241 (65.31%) were from female and 128 (34.69%) from male. Among 369 samples, 209 (56.64%) were having single isolate and in 125 (33.88%) samples, two types of bacteria were isolated and in 35 (9.48%) samples showed no growth in culture.

**Table 1:** Gender wise distribution of samples collected from patients (N=369)

Gender	Total no. of swab	Percentage
Male	128	34.69%
Female	241	65.31%

Out of 459 isolates, 133 Gram positive cocci and 326 Gram negative bacilli were isolated. Among various bacterial isolates *Pseudomonas Aeruginosa* was most commonly isolated bacteria followed by *Staphylococcus spp.* and *Klebsiella Pneumoniae*.

In our study, methicillin resistance was 94.87% among *Staphylococcus Aureus* and 75% in Coagulase negative Staphylococci. Most of the isolates were resistant to penicillin, ciprofloxacin and gentamicin and susceptible to vancomycin, linezolid and teicoplanin. D test was performed to see inducible clindamycin resistance which showed 68 isolates to have D test positive.

Most of Gram negative isolates were resistant to routinely used antimicrobial agents and even 39 out of 326 isolates were resistant to imipenam which is used as reserve drug for multidrug resistant organism.

**Table 2:** Distribution of bacterial isolates from infected burn wounds

Organism	Total (n= 459)	Percentage (%)
<i>Pseudomonas aeruginosa</i>	156	33.99
<i>Staphylococcus aureus</i>	117	25.49
<i>Klebsiellapneumoniae</i>	110	23.96
<i>Escherichia coli</i>	31	6.75
<i>Proteus spp.</i>	18	3.92
CONS	16	3.49
<i>Acinetobacter spp.</i>	11	2.40

CONS = Coagulase negative Staphylococcus

**Table 3:** Antimicrobial resistance pattern among Gram positive cocci

Antibiotics	<i>S. aureus</i> (N=117)	CONS (N=16)
Amikacin	59 (50.43%)	5 (31.25%)
Cefoxitin	111 (94.87%)	12 (75%)
Ciprofloxacin	92 (78.63%)	09 (56.25%)
Clindamycin	81 (69.23%)	09 (56.25%)
Erythromycin	84 (71.79%)	10 (62.5%)
Gentamicin	87 (74.35%)	11 (68.75%)
Netilmicin	51 (43.58%)	05 (31.25%)
Penicillin	117 (100%)	15 (93.75%)

**Table 4:** Antimicrobial resistance pattern in Gram negative isolates

Antibiotics	<i>P. aeruginosa</i> (N=156)	<i>Acinetobacter</i> (N=11)	<i>Klebsiella pneumoniae</i> (N=110)	<i>E. coli</i> (N=31)	<i>Proteus spp.</i> (N=18)
Amikacin	NT	NT	75 (68.18%)	19 (61.29%)	12 (66.66%)
Aztreonam	NT	NT	71 (64.54%)	19 (61.29%)	12 (66.66%)
Cefixime	NT	8 (72.73%)	78 (70.91%)	21 (67.74%)	12 (66.66%)
Ceftazidime	123 (78.85%)	8 (72.73%)	79 (71.82%)	22 (70.96%)	13 (72.22%)
Cefotaxime	NT	9 (81.82%)	90 (81.82%)	24 (77.42%)	13 (72.22%)
Ciprofloxacin	126 (80.77%)	9 (81.82%)	93 (84.54%)	25 (80.64%)	14 (77.77%)
Cefpodoxime	NT	8 (72.73%)	86 (78.18%)	24 (77.42%)	14 (77.77%)
Ceftizoxime	NT	9 (81.81%)	79 (71.82%)	23 (74.19%)	13 (72.22%)
Cefepime	117 (75%)	8 (72.73%)	78 (70.91%)	22 (70.96%)	13 (72.22%)
Gentamicin	126 (80.77%)	9 (81.82%)	82 (74.54%)	24 (77.42%)	14 (77.77%)
Netilmicin	NT	NT	84(76.36%)	23 (74.19%)	14 (77.77%)
Tobramycin	93 (59.61%)	7 (63.64%)	59 (53.64%)	15 (48.38%)	9(50%)
Piperacillin-tazobactam	109 (69.87%)	6 (54.54%)	66 (60%)	20 (64.51%)	11 (61.11%)
Cefoperazone	124 (79.48%)	NT	NT	NT	NT
Imipenam	23 (14.74%)	3 (27.27%)	10 (9.09%)	1 (3.22%)	2 (11.11%)

NT = Not Tested

## Discussion

Burn injury is one of the more common and devastating forms of trauma in many areas of the world. Infection in burn patients is of major concern as it complicates overall management. Irrational and long term administration of oral and intravenous antibiotics could lead to development of antimicrobial resistance among the pathogens.

In our study, total of 369 samples were received from burn patients amongst which female to male ratio was 1.9:1, similarly in a study done by Rathod V S et al. (2017) [7] who showed that isolates from female (76.14%) were more than male (23.85%) while lower rate was seen in a study done by Dash et al. (2013) [2] & Rajeshwar et al. (2014) [11], who showed female : male ratio as 1.17:1 & 1:1.3 respectively. In India higher incidence of burn injuries among females may be related to inadequate precautions during cooking, wearing of loose sarees, inability to cope up with the physical and psychological stress of marriage and harassment from parents in law [2].

Among 369 samples, growth was seen in 334 (90.51%) sample and no growth in 35 (9.49%) samples which is similar to study done by Rathod V S et al. (2017) [6], who showed isolation of organism from 96.14% samples. Single organism was isolated from 209 (56.63%) and multiple isolates were found in 125 (33.87%) samples which is similar to study of Mohapatra et al. (2017) [4] where single isolates was seen in 43% and multiple isolate 32%.

Out of 469 isolates, 133 (28.97%) Gram positive cocci & 326 (71.03%) Gram negative bacilli were

isolated which is similar to study done by Asati et al. (2017) [5] who showed isolation of Gram negative bacilli and Gram positive cocci as 76% and 24% respectively, while higher isolation of Gram negative bacilli (83.59%) was shown by Pooja et al. (2016) [1].

Among various bacterial isolates, *P.seudomonas aeruginosa* (33.98%) was most commonly isolated bacteria which is similar to study done by Pooja et al. (2016) (33.59%) 1, Mohapatra et al. (2017) [4] (27%), while higher isolation was seen in a study done by Dash et al. (2013) [2] (49.4%). Although *S.aureus* remains a common cause of early burn wound infection, *P.aeruginosa* from patient's endogenous gastrointestinal flora or moist environmental source is the most common cause of burn infection. The second most common isolate in our study was *Staphylococcus aureus* (25.48%) followed by *Klebsiella Pneumoniae* (23.96%) which is similar to study of Dash et al. (2013) [2] while in a study done by pooja et al. (2016) [1], *Klebsiella Pneumoniae* was second most common isolate.

In our study methicillin resistance was 94.87% among *S.aureus* and 75% among coagulase negative *Staphylococcus* which is much higher than study done by Mohapatra et al. (2017) [4] who showed prevalence of methicillin resistance as 20% and 40% respectively. In our study, all isolates were resistant to penicillin, 69.2% to clindamycin and 71.79% to erythromycin and coagulase negative *Staphylococcus* (CONS) were 93.75% resistant to penicillin, 56.25% to clindamycin and 62.5% to erythromycin. In our study erythromycin and clindamycin resistance was higher as compared to study done by Asati

et al. (2017) [5]. D test was done to see inducible clindamycin resistance which showed 54.70% *S.aureus* isolates and 25% CONS isolates D test positive, while in study done by Mohapatra et al. (2017) [4] 43% CONS shows positive D test. All isolates were sensitive to linezolid, vancomycin, teicoplanin similar to study of Pooja et al. (2016) [1] and Dash et al. (2013) [2].

In our study, most of the isolates of *P.aeruginosa* were resistant to commonly used antibiotics and 23 (14.74%) out of 156 isolates were resistant to imipenam which is higher than study of Dash et al. (2013) [2], Rathod et al. (2017) [7], and similar to study done by Pooja et al. (2016) [1] (15.90%). Among *Acinetobacter* isolates 3 (27.27%) out of 11 isolates of were resistant to imipenam which is lower as compared to study done by Pooja et al. (2016) [1] while in study done Dash et al. (2013)[2] all the isolates were sensitive to imipenam. All the isolates of *P.aeruginosa* and *Acinetobacter* spp. were sensitive to colistin.

In our study members of *Enterobacteriaceae* family were also resistant to most of the commonly used antibiotics and even 13 out of 159 isolates were resistant to imipenam which is less than study done by Pooja et al. (2016) [1] while in study done by Rathod V S et al. (2017) [7] & Rajeshwar et al. (2014) [11] all the isolates were sensitive to imipenam. In our study resistance pattern was higher than other may be due to improper and over use of antibiotics. It is also known that widespread use of broad spectrum antimicrobials in burn units may lead to acquisition of resistance and transformation to form new strains.

## Conclusion

The present study conclude that *P. aeruginosa* and *S. aureus* are the leading cause of infection in burn patients and isolation of multidrug resistant organism should be considered as a serious risk in burn unit. Early identification of infection caused by multidrug resistant organisms might help to modify treatment and outcome in burn patient.

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