ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 01 | January - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AEROBIC BACTERIOLOGY OF BURN WOUND INFECTIONS IN A TERTIARY CARE CENTRE IN AJMER: A PROSPECTIVE STUDY

Microbiology

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ABSTRACT

Background: Burn wounds rapidly become colonised due to loss of the epidermal barrier and local immune suppression, driving infection-related morbidity (Church et al., 2006). **Objectives:** To define the aerobic bacteriological profile of burn wound specimens and their antimicrobial susceptibility patterns in a tertiary care burn unit. **Methods:** Prospective study of 116 admitted patients (Oct 2023–Sep 2024); wound swabs were cultured on MacConkey and 5% sheep blood agar; identification used standard biochemical methods (Forbes et al., 2007); susceptibility was determined by Kirby–Bauer per CLSI guidelines (Bauer et al., 1966; CLSI, 2023). **Results:** Culture positivity was 96.55% (112/116); Gram-negative bacilli predominated (81.25%) versus Gram-positive cocci (18.75%). *Pseudomonas spp.* was the most frequent isolate (55.17%), followed by *Escherichia coli* (11.21%), CoNS (7.76%) and *Klebsiella spp.* (6.03%). *Pseudomonas* showed highest susceptibility to imipenem (90.63%), meropenem (89.06%) and piperacillin–tazobactam (78.13%), while susceptibility to ceftazidime (20.31%) and tobramycin (37.50%) was low. **Conclusions:** The microbial landscape was dominated by multidrug-resistant Gram-negative organisms, notably Pseudomonas. These findings support early culture-guided therapy, carbapenem stewardship, and strict infection-control measures tailored to local resistance patterns.

KEYWORDS

burn wound infection, pseudomonas aeruginosa, antimicrobial resistance

INTRODUCTION

Burn injuries constitute a substantial public health burden in India, with estimates suggesting 6–7 million cases annually (WHO, 2018). Loss of the epidermal barrier and the protein-rich eschar promote rapid colonisation and invasion, with early Gram-positive flora frequently superseded by Gram-negative opportunists, especially Pseudomonas aeruginosa (Church et al., 2006). Infection-related complications account for the majority of late mortality in severe burns, underscoring the importance of timely culture, susceptibility testing, and infection-control measures (Agnihotri et al., 2004; Church et al., 2006). Local epidemiology and resistance trends are central to empiric therapy selection and stewardship, warranting periodic surveillance to inform policy and practice (Mehta et al., 2007; Saxena et al., 2013).

MATERIALS AND METHODS

Study Design And Setting:

A prospective hospital-based study conducted in the Department of Microbiology, J.L.N. Medical College & Associated Hospitals, Ajmer (Rajasthan), from October 2023 to September 2024.

Sample Size And Participants:

A total of 116 admitted burn patients were included; immuno-compromised patients were excluded.

Sample Collection:

Wound swabs were collected after 48 hours of admission using aseptic technique and processed immediately.

Culture And Identification:

Swabs were inoculated on MacConkey and 5% sheep blood agar and incubated at 37°C for 24–48 hours; isolates were identified by standard biochemical methods (Forbes et al., 2007).

Antimicrobial Susceptibility Testing:

Kirby–Bauer disc diffusion was performed per CLSI guidelines (Bauer et al., 1966; CLSI, 2023).

Ethics: Institutional Ethics Committee approval was obtained; written informed consent was taken; 169/2429/Acad-III/MCA/2023.

Statistics: Data were analyzed using SPSS version 29.0.

RESULTS

Culture Positivity:

Growth was observed in 96.55% (112/116) of specimens.

Type Of Organism Growth:

Gram-negative bacilli constituted 81.25% (n = 91) of growth-positive cultures, whereas Gram-positive cocci accounted for 18.75% (n = 21)

Table 1: Antimicrobial Susceptibility Pattern Of Gram-positive Isolates

Organism (n)	AMP	CXN	CD	DO	E	CIP	LE	LZ	PEN G	VA
Staphylococcus aureus (n=6)	NT	4/6	4/6	3/6	5/6	3/6	3/6	5/6	2/6	5/6
CoNS (n=9)	NT	4/9	2/9	4/9	3/9	6/9	7/9	7/9	1/9	9/9
Enterococcus spp. (n=6)	1/6	NT	NT	3/6	2/6	2/6	NT	5/6	NT	6/6

NT = Not Tested

- CXN (Cefoxitin), CD (Clindamycin), E (Erythromycin), LZ (Linezolid), VA (Vancomycin), CIP (Ciprofloxacin), LE (Levofloxacin), DO (Doxycycline), PEN G (Penicillin G).
- S. aureus and CoNS show strongest activity to VA and LZ; Enterococcus is uniformly susceptible to VA in the cohort.

Table 2: Antimicrobial Susceptibility Pattern Of Gram-negative Isolates

Organism (n)	AK	AMP	AMC	CPM	CTX	CAZ	CAC	CTR	CIP	COT	GEN	IPM	LE	MR	PIT	AZT	TOB
Citrobacter spp (n=3)	1/3	0/3	0/3	0/3	1/3	0/3	1/3	1/3	0/3	1/3	1/3	3/3	2/3	3/3	2/3	NT	NT
Escherichia coli (n=13)	6/13	3/13	3/13	6/13	6/13	3/13	6/13	6/13	5/13	7/13	10/13	12/13	7/13	12/13	9/13	NT	NT
Klebsiella spp. (n=7)	4/7	1/7	2/7	2/7	3/7	1/7	2/7	3/7	3/7	1/7	4/7	6/7	5/7	5/7	4/7	NT	NT
Proteus spp. (n=4)	2/4	1/4	0/4	0/4	1/4	1/4	2/4	1/4	3/4	3/4	2/4	4/4	3/4	4/4	3/4	NT	NT
Pseudomonas spp. (n=64)	NT	NT	NT	44/64	NT	13/64	NT	NT	NT	NT	NT	58/64	40/64	57/64	50/64	30/64	24/64

NT= Not Tested

 PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

- AK (Amikacin), GEN (Gentamicin), IPM (Imipenem), MR (Meropenem), PIT (Piperacillin–Tazobactam), CPM (Cefepime), CTX (Cefotaxime), CTR (Ceftriaxone), CAZ (Ceftazidime), CAC (Ceftazidime+Clavulanic acid), AMC (Amoxicillin-clavulanate), AMP+S (Ampicillin+Sulbactam), CIP/LE (Fluoroquinolones), AZT (Aztreonam), TOB (Tobramycin).
- Carbapenems (IPM, MR) and PIT are the strongest across *E. coli, Klebsiella, Proteus*, and *Pseudomonas;* CAZ activity is low against Pseudomonas (13/64)

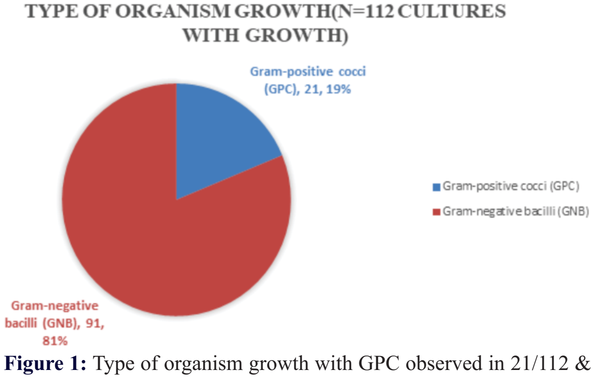

Figure 1: Type of organism growth with GPC observed in 21/112 & GNC 91/112.

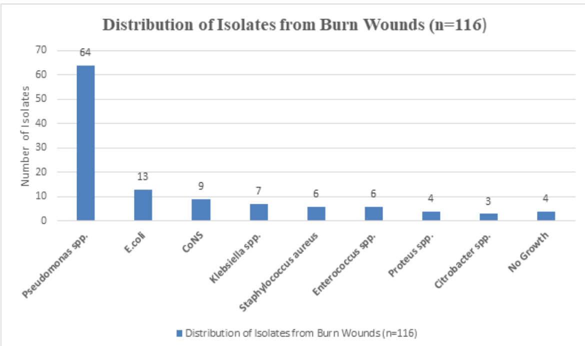

Figure 2:
Distribution of Isolates: *Pseudomonas spp*. was the most frequent isolate (55.17%), followed by *Escherichia coli* (11.21%), *Coagulase-negative staphylococci* (7.76%), *Klebsiella spp.* (6.03%), and *Staphylococcus aureus* (5.17%).

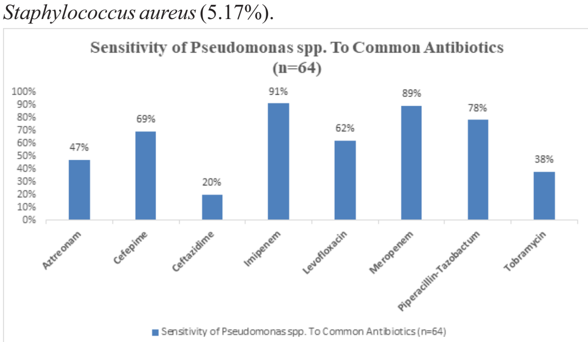

Figure 3:
Antimicrobial Susceptibility of *Pseudomonas spp.*: High susceptibility was observed to imipenem (90.63%), meropenem (89.06%), and piperacillin–tazobactam (78.13%), with lower susceptibility to ceftazidime (20.31%) and tobramycin (37.50%).

DISCUSSION

The predominance of Gram-negative bacilli, particularly *Pseudomonas aeruginosa,* in burn wound infections mirrors patterns reported in Indian tertiary centres (Saxena et al., 2013; Patil et al., 2015). The susceptibility profile, with high activity of carbapenems and piperacillin–tazobactam against *Pseudomonas*, suggests these agents remain viable options when guided by culture and sensitivity, albeit with careful stewardship to protect their utility (Mehta et al., 2007). Elevated resistance to third-generation cephalosporins and aminoglycosides underscores the need to avoid empiric broad-spectrum use and to implement strict infection-control measures-prompt debridement, barrier precautions, and regular surveillance-tailored to local resistance trends (Agnihotri et al., 2004; Church et al., 2006).

CONCLUSION

Burn wound infections in this cohort were dominated by multidrug-resistant Gram-negative organisms, with *Pseudomonas spp*. as the leading pathogen. Empiric therapy should prioritise agents with proven local efficacy while reinforcing antibiotic stewardship and robust infection-control protocols. Periodic reviews of microbial profiles and resistance patterns are essential to adapt treatment strategies and reduce morbidity and mortality.

Conflict Of Interest: None declared.

Funding: No funding was received for this study.

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