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Research Article

Prevalence of Resistance to Antimicrobial Agents by *Pseudomonas aeruginosa* and *Acinetobacter baumannii* Isolated from Iraqi Patients with Burns at Al-Nasiriya Hospital

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Abstract

Background: Burn injuries disrupt skin barriers and weaken immune defenses, predisposing patients to opportunistic, drug-resistant Gram-negative infections. These findings highlight the urgent need for targeted prevention and treatment strategies in burn care settings.

Objective: To evaluate the prevalence, pattern as well as clinical significance of *Pseudomonas aeruginosa* and *Acinetobacter baumannii* in patients with burns.

Method: A prospective observational study was conducted from April 2024 to April 2025. One hundred and fifty clinical samples from burn patients were collected and processed using standard microbiological methods. Identification of isolates and antimicrobial susceptibility testing followed Clinical & Laboratory Standards Institute guidelines. Descriptive statistics were used to summarize patient characteristics and isolate distribution (frequencies, percentages). Inferential analysis was performed using Fisher's Exact Test to examine associations between infection timing (early vs late) and key clinical variables (e.g., pathogen type and resistance profiles); a p-value < 0.05 was considered statistically significant. Data on infection timing, patient demographics, and clinical presentation were analyzed to determine high-risk periods and patterns.

Results: Eighty isolates were recovered: *P. aeruginosa* (n=48), *A. baumannii* (n=19), and 13 cases of co-infection. A distinct peak in *P. aeruginosa* infections occurred between days 21–30 of hospitalization, marking a critical nosocomial transmission phase. Gender variation in *A. baumannii* was noted, with females infected earlier and males later in the hospital stay. Bloodstream infections represented 40% of cases, with *P. aeruginosa* significantly more prevalent than *A. baumannii* ($p<0.05$).

A. baumannii showed complete resistance to imipenem, tobramycin, and netilmicin. *P. aeruginosa* demonstrated 100% resistance to tobramycin and netilmicin, and over 97% resistance to ofloxacin and aztreonam. Both pathogens retained full sensitivity to colistin and polymyxin B.

Conclusion: Burn patients face a high risk of multidrug-resistant *P. aeruginosa* and *A. baumannii* infections, especially in the third and fourth weeks of hospitalization. Early detection, strict infection control, and antimicrobial stewardship are essential to improve outcomes and reduce mortality in burn units.

Keywords: *Acinetobacter baumannii*; Al-Nasiriyah; Antimicrobial resistance; Burn patients; Iraq; *Pseudomonas aeruginosa*.

Introduction

Burn injuries are among the most devastating forms of trauma worldwide, particularly in low- and middle-income countries, where they are associated with substantial morbidity, prolonged hospitalization, and increased mortality (1). Clinically, burn severity is determined mainly by burn depth—ranging from superficial partial-thickness to deep partial-thickness and full-thickness burns—and by the percentage of total body surface area (TBSA) involved. Together, these two parameters strongly predict fluid loss, immune dysregulation, infectious complications, and death (1,2). Major burns exceeding 20–30% TBSA, especially when full-thickness areas are present, are linked to profound systemic inflammation, immunosuppression, and a markedly increased risk of local wound infection, sepsis, and multiple organ dysfunction (2-5).

Burn wounds are initially sterile but rapidly become colonized by endogenous skin and gut flora as well as environmental microorganisms during the first days after injury. If bacterial load and virulence exceed host defenses, this continuum may progress from simple colonization to local burn wound infection, invasive wound infection, and ultimately systemic infection or sepsis, as described in the American Burn Association (ABA) criteria (3,4). Local infection is typically confined to the wound surface and manifests as increased exudate, discoloration, malodor, and delayed

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epithelialization, whereas invasive or systemic infection is associated with fever or hypothermia, tachycardia, leukocyte abnormalities, hypotension, and evolving organ dysfunction (3,4). Invasive infection and sepsis are now recognized as leading causes of late morbidity and mortality in patients with major burns (2,5).

Among the pathogens that colonize and infect burn wounds, *Pseudomonas aeruginosa* is one of the most clinically significant opportunistic bacteria in intensive care and burn units (5,6). This Gram-negative, non-fermenting bacillus is highly adapted to moist hospital environments—including sinks, taps, catheters, endotracheal tubes, and wound dressings—allowing it to persist on abiotic surfaces and devitalized tissue (5,6). Studies from specialized burn centers show that *P. aeruginosa* colonizes roughly one-third to more than half of major burn wounds, particularly in late hospitalization, and is often the dominant pathogen (6,7). Its pathogenicity reflects a combination of potent virulence factors—such as elastases, proteases, exotoxin A, pyocyanin, rhamnolipids, and a type III secretion system—and its ability to form mature biofilms regulated by quorum-sensing systems and cyclic di-GMP signaling (6,8). Biofilm-embedded cells are highly tolerant to antibiotics, disinfectants, and host immunity, predisposing to chronic colonization, graft failure, and progression to sepsis (6,8). In addition, *P. aeruginosa* expresses multiple intrinsic and acquired antimicrobial resistance (AMR) mechanisms, including low outer-membrane permeability, efflux pumps, and chromosomal or plasmid-mediated β-lactamases (6). These contribute to multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains, and carbapenem-resistant P. aeruginosa is now classified by the World Health Organization as a critical-priority pathogen due to limited treatment options and its association with increased mortality and longer ICU stay (5,6).

A. baumannii is another non-fermenting Gram-negative pathogen of major concern in burn units, notable for its ability to survive on dry surfaces, cause ICU outbreaks, and rapidly acquire carbapenem resistance (1,9). MDR and XDR *A. baumannii* infections are linked to high mortality in critically ill and severely burned patients and are also prioritized internationally because of scarce therapeutic options and a strong tendency for nosocomial spread (9).). In many burn centers, *P. aeruginosa* and *A. baumannii* together account for a substantial proportion of Gram-negative burn wound and bloodstream infections, especially in patients with high-TBSA, full-thickness burns and prolonged ICU stays (1,5,7,9). The impact of AMR caused by these pathogens is particularly critical in low- and middle-income countries, where burn incidence is high and infection-control resources are constrained (1,9). Given these challenges and the limitations of conventional antibiotics, emerging strategies such as bacteriophage therapy, quorum-sensing and biofilm-disrupting agents, antimicrobial peptides, and immune-modulating approaches are being explored to improve bacterial clearance and wound healing in MDR/XDR *P. aeruginosa* infections (5,6,8). The study conducted to evaluate the prevalence, pattern as well as clinical significance of *P. aeruginosa* and *A. baumannii resistance to antimicrobial agents in* burn patients admitted to Al-Nasiriyah Teaching Hospital, with the goal of generating local evidence to guide infection-control policies and antibiotic stewardship and to help reduce morbidity and mortality in burn units in southern Iraq.

Materials and Methods

Samples Collection and phenotypic analysis

A prospective observational study was conducted from April 23rd , 2024, to April 23rd , 2025. A number of 150 samples was collected from burn patients in the Burn Unit at Al-Nasiriyah Teaching Hospital using Cary-Blair swabs. Careful procedures and strict sterile techniques were followed to ensure patient comfort and sample integrity during collection.

After collection, all samples were cultured on Blood Agar and MacConkey Agar media. Initial biochemical tests were subsequently performed to identify the bacterial species. Out of the total samples, 80 isolates were confirmed as either *P. aeruginosa* or *A. baumannii*, which are frequently encountered pathogens in burn infections and confirmed using Vitek 2 System.

Antibiotics discs

The study, tested the effectiveness of selected antibiotics against two major Gram-negative pathogens: *P. aeruginosa* and *A. baumannii*. The following antibiotics were included: Ceftazidime (CAZ 30 µg), Cefepime (FEP 30 µg), Meropenem (MEM 10 µg),

Imipenem (IPM 10 µg), Ciprofloxacin (CIP 5 µg), Levofloxacin (LEV 5 µg), Ofloxacin (OFX 5 µg), Tobramycin (TOB 10 µg), Amikacin (AK 30 µg), Netilmicin (NET 30 µg), Piperacillin/tazobactam (PIP/TAZ 100/10 µg), Ampicillin-sulbactam (AMS 10/10 µg), Colistin (C, MIC) ,Polymyxin B (PB, MIC) from HIMEDIA/India,

These antibiotics were selected based on their clinical relevance and their activity against *P. aeruginosa* and *A. baumannii*, particularly in hospital-acquired infections. The resistant to Colistin and polymyxin B were tested using Vitek 2 System due to their role in treating multidrug-resistant strains.

Molecular Diagnosis

Molecular identification of *P. aeruginosa* and *A. baumannii* was performed using polymerase chain reaction (PCR) with species-relevant genetic targets.

The 16S rRNA gene, a highly conserved bacterial sequence, was used for broad detection of *P. aeruginosa*, amplified with forward primer 5′-

GGGGGATCTTCGGAACCTCA-3′ and reverse primer 5′-TCCTTAGAGTGCCCAAACCCG-3′, to generate 312 bp at 55°C (10).

Specific detection of *A. baumannii* relied on the intrinsic OXA-51-like gene, amplified with forward primer 5′-TAATGCTTTGATCGGCCTTG-3′ and reverse primer 5′-TGGATTGCACTTCATCTTGG- 3′, yielding 353 bp at 53°C (11). This combined strategy enabled simultaneous broad-spectrum bacterial detection and precise identification of *A. baumannii* within clinical samples.

Extraction of DNA

Genomic DNA was isolated from *P. aeruginosa* and *A. baumannii* using the Favorgen (China) extraction kit in accordance with the manufacturer's protocol. DNA yield and purity were determined on a NanoDrop spectrophotometer, with concentrations expressed in ng μl^{-1} and purity confirmed via the A_{260}/A_{280} absorbance ratio.

Data analysis

In this study, Fisher's Exact Test was employed to determine whether there was a statistically significant association between bacterial species (*P. aeruginosa and A. baumannii)* and the occurrence of bloodstream infections in burn patients.

Given the relatively small sample size and categorical nature of the variables (presence or absence of bloodstream infection by bacterial type), Fisher's Exact Test was the most appropriate statistical tool.

Results

Temporal Distribution of Bacterial Infections During Hospitalization According to the Patients' Genders

The present investigation identified *Pseudomonas aeruginosa* in 48 clinical cases, comprising 26 male and 22 female patients. *A.baumannii* was confirmed in 19 cases, including 11 males and 8 females. Additionally, 13 patients presented with co-infections involving both *P. aeruginosa* and *A. baumannii*, distributed between 6 males and 7 females as Table 1.

Table 1 Distribution of Bacterial Infections by Pathogen and Gender

Infection type	Total cases (No.)	Males (No.)	Females (No.)
P. aeruginosa	48	26	22
A.baumannii	19	11	8
Co-infection (P. aeruginosa + A. baumannii)	13	6	7
Total (all infection types)	80	43	37

Out of 150 clinical samples collected during the study period, 80 (53.3%) were positive for one or both bacterial species. The remaining samples yielded other bacterial pathogens, which were excluded from further analysis as they were outside the scope of the current study Table 2.

Table 2. Positive Culture of Clinical Samples

Variable	No.	%
Total clinical samples collected	150	100
Samples positive for *P. aeruginosa* and/or *A. baumannii*	80	53.3
Samples yielding other bacterial pathogens (excluded)	70	46.7

The incidence of *P. aeruginosa* infection increased markedly during days 21–30 of hospital stay, affecting 11 male and 12 female patients. In contrast, *A. baumannii* showed a distinct gender- and time-related pattern: during days 1–10, infections were more common in females (5) than males (2), whereas during days 11–20, cases were observed exclusively in males (7). Co-infections were relatively uncommon overall but exhibited a slight increase during days 21–30, with 3 male and 2 female cases. Outside this interval, co-infection rates remained consistently low, as shown in Table 3.

Table 3. Temporal Distribution of Infections by hospital stay

Pathogen	Hospital period (days)	Males (No.)	Females (NO.)
Pseudomonas aeruginosa	21–30	11	12
Acinetobacter baumannii	1–10	2	5
Acinetobacter baumannii	11–20	7	0
Co-infection (*P. aeruginosa* + *A. baumannii*)	21–30	3	2

Overall, *P. aeruginosa* was the most prevalent pathogen, followed by *A. baumannii* and co-infections, as in Figure 1 and 2.

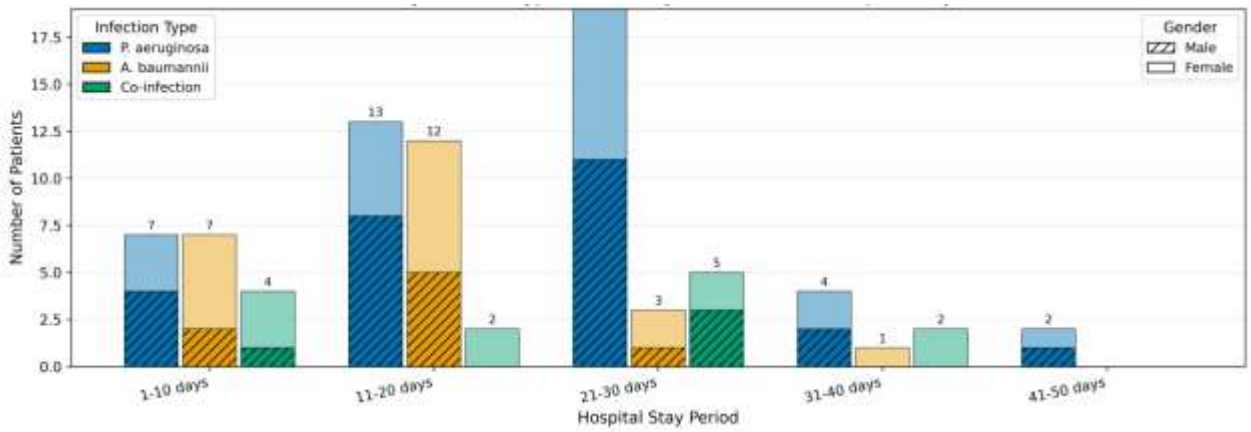

Figure 1: Distribution of infections to hospital stay.

Bloodstream Infection Findings

Out of 80 patients included in the study, 32 (40%) were confirmed to have bloodstream infections (BSI), while 48 (60%) showed no evidence of BSI. *Pseudomonas aeruginosa* was the most frequently isolated pathogen, detected in 13 male and 9 female patients. *A. baumannii* infections were less common, recorded in 1 male and 3 female patients. Co-infections involving both pathogens were identified in 6 males and 7 females, indicating a relatively balanced gender distribution.

P. aeruginosa was the most frequently isolated pathogen, identified in 22 of 80 patients (27.5%). In contrast, *A. baumannii* showed the lowest prevalence among males, with only a single case (1.25%). Co-infections were detected in 7.5% of male patients and 8.75% of female patients. Fisher's exact test revealed a statistically significant difference in the distribution of BSI among the bacterial species ($P < 0.05$), confirming *P. aeruginosa* as the predominant bloodstream pathogen. Figure 2 below illustrates the distribution of BSI and non- infectious cases among male and female patients for *P. aeruginosa, A. baumannii*, and their co-infections.

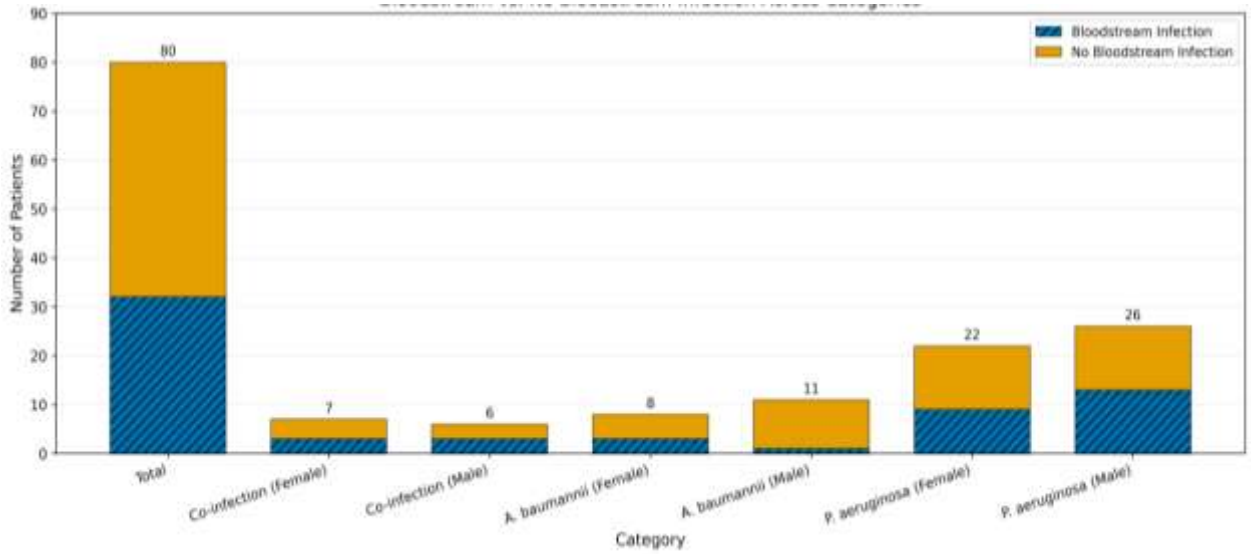

Figure 2: Distribution of bloodstream infections (BSI) and non-infectious cases among male and female patients for *P. aeruginosa, A. baumannii,* and their co-infections.

Antibiotic Susceptibility of *Acinetobacter* spp.

In the present study, the antibiotic susceptibility profile of *Acinetobacter sp*. isolates (N = 19) was evaluated against a range of commonly used antimicrobial agents. A notable multidrug resistance pattern was observed, particularly to carbapenems and aminoglycosides. Complete resistance (100%) was detected for imipenem, tobramycin, and netilmicin. Conversely, complete sensitivity (100%) was recorded for meropenem, colistin, polymyxin B, and ampicillin-sulbactam, indicating their continued efficacy. Ciprofloxacin and levofloxacin demonstrated moderate effectiveness, with 68.4% sensitivity, while amikacin showed 63.2% sensitivity. Among β-lactam/β-lactamase inhibitors, piperacillin-tazobactam and cefepime both exhibited sensitivity rates of 78.9%.

These findings highlight the importance of routine susceptibility testing and targeted antibiotic use, particularly in high-risk environments such as burn units and critical care wards. The complete resistance to key agents such as imipenem underscores the need to limit empirical use of broad-spectrum antibiotics. Figure 3 below illustrates the antibiotic susceptibility profile of *Acinetobacter sp*. in this study.

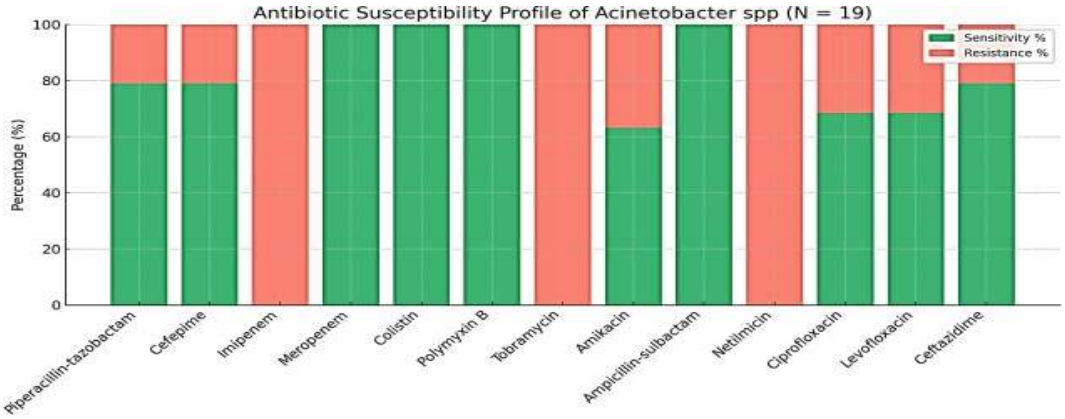

Figure (3): Antibiotic Susceptibility Profile of *Acinetobacter spp.*

Antibiotic Susceptibility of *P. aeruginosa*

This study examined the antibiotic susceptibility of *P. aeruginosa* isolated from burn patients (N = 48), revealing a diverse resistance pattern. Notably, the organism exhibited complete sensitivity (100%) to colistin and polymyxin B, which remain among the most effective options for multidrug-resistant strains. In contrast, all isolates were completely resistant (100%) to tobramycin and netilmicin, while resistance to ofloxacin and aztreonam exceeded 97%, indicating significant limitations in their clinical utility. Meropenem demonstrated a high sensitivity rate of 93.8%, followed by ciprofloxacin (66.7%) and levofloxacin (58.3%), suggesting these agents retain moderate efficacy.

Imipenem also showed good performance with a 64.6% sensitivity rate. However, piperacillin-tazobactam and cefepime showed low sensitivity levels (37.5% and 4.2%, respectively), highlighting the need for cautious use. These findings reinforce the importance of individualized antibiotic selection based on susceptibility testing, especially in high- risk units like burn centers, to mitigate the spread of resistant *P. aeruginosa* strains and improve patient outcomes.

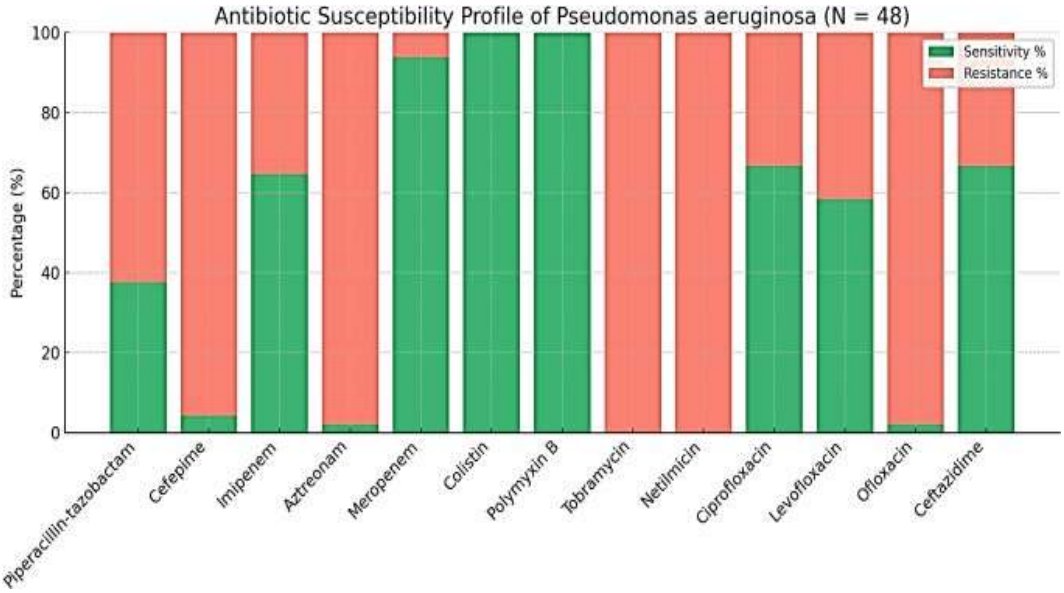

Figure (4): Susceptibility of *P.aeruginosa.*

Discussion

Distribution of Infections by Length of Hospital Stay The results indicated that the third and fourth weeks of hospitalization represent a critical period for the acquisition and spread of *P. aeruginosa*

During days 21–30, there was a noticeable increase in cases, indicating that infection control should be strengthened during this period. The change in the pattern of *A. baumannii* infections being more common in females in the first 10 days and then occurring only in males in the next 10 days—may reflect differences in how patients are exposed, how their bodies respond, or how their care is provided.

The concentration of co-infections within the same high-risk period as *P. aeruginosa* suggested that they may share common risk factors, such as environmental contamination, cross-transmission between patients, or impaired immune status. These findings emphasize the need for strengthened, targeted infection-prevention measures during prolonged hospital stays, especially in burn units and among immunocompromised patients.

Previous studies support these observations. While there were report that burn wound infections tend to peak in the second to fourth weeks of hospitalization, with P. aeruginosa as the leading cause of bloodstream infections and sepsis (6). Roy (7) similarly found that the risk of multidrug-resistant organism acquisition rises significantly after day 7, peaking between days 15–30, and highlighted the role of early surveillance and wound decontamination.

Choi(8) documented the spread of carbapenem-resistant *A. baumannii* in a burn unit, linking environmental contamination to transmission, while Hu *et al.* (9) noted that in severe burn patients, bloodstream infections occur both early (within the first week) and later (after day 7), reflecting a progression from colonization to systemic infection for both pathogens.

The Incidence of Bloodstream Infection (BSI). The predominance of *P. aeruginosa* in BSI cases observed in this study aligns with existing literature on burn patients. Özdemir.(13) identified *P. aeruginosa* as the leading cause of BSI in burn patients (24.4%), followed by *A. baumannii* (19.7%), with over one-third of BSIs originating from burn wound sources. This emphasizes the crucial role of wound colonization in the progression to systemic infection.

Similarly, Yang. (14) conducted a large-scale meta-analysis of over 62,000 isolates from Chinese burn units, ranking *P. aeruginosa* (~16.2%) and *A. baumannii* (~11.8%) as the most common Gram-negative organisms. Christie (15) further reported *A. baumannii* as the leading Gram-negative pathogen in pediatric burn BSIs, closely followed by *P. aeruginosa*, especially in patients with invasive devices such as central lines.

The high resistance patterns reported in these studies mirror the clinical challenges faced globally. Özdemir (13); documented carbapenem resistance in 100% of *A. baumannii* and 60% of *P. aeruginosa* isolates, underscoring the threat to empirical therapy. The current findings confirm *P. aeruginosa* as the dominant BSI pathogen in this cohort, with *A. baumannii* showing relatively lower prevalence, particularly among males. This discrepancy may reflect differences in antimicrobial stewardship, infection control measures, and sample size. Nevertheless, the occurrence of co-infections aligns with global observations and highlights the necessity of ongoing surveillance and targeted interventions to reduce the impact of multidrug-resistant Gram-negative infections in burn units.

Susceptibility of *Acinetobacter* spp.

The finding of 100% resistance to imipenem, tobramycin, and netilmicin is consistent with

previous reports. Yang, (14). documented a similar resistance pattern in *A. baumannii* isolates from burn centers, reinforcing the global concern over carbapenem-resistant *A. baumannii* (CRAB) in critical care settings.

In contrast, the observed 100% sensitivity to colistin, polymyxin B, meropenem, and ampicillin-sulbactam mirrors results reported by Fleming, et al (15), who confirmed the continued effectiveness of polymyxins in burn patient infections, despite their classification as last-resort antibiotics. While their preserved susceptibility is encouraging, literature warns of the risk of resistance development with overuse.

The moderate sensitivity rates to ciprofloxacin, levofloxacin, and amikacin align with findings by Benitez,.(16), who noted variable outcomes influenced by local prescribing habits and prior antibiotic exposure. Similarly, the relatively high susceptibility to piperacillin-tazobactam and cefepime in this study supports the role of β-lactam/β-lactamase inhibitor combinations when guided by susceptibility results.

However, as Dubey.(17), emphasized, the biofilm-forming ability and environmental persistence of *Acinetobacter sp*. present ongoing challenges to eradication. Collectively, these results highlight the urgent need for stringent antibiotic stewardship, infection control protocols, and the prioritization of culture-guided therapy to combat the spread of multidrug-resistant strains.

Susceptibility of *Pseudomonas aeruginosa*

The observed 100% sensitivity to colistin and polymyxin B confirms their continued efficacy against multidrug-resistant (MDR) strains and supports their role as last-resort agents. These results are consistent with recent global data, including a in study (18), which reaffirmed the preserved potency of polymyxins against extensively drug-resistant *P. aeruginosa strains*, especially in ICU and burn settings (18). Conversely, the complete resistance (100%) to tobramycin and netilmicin, as well as the extremely high resistance to ofloxacin and aztreonam (>97%), highlights the diminishing utility of these agents in severe infections. This trend aligns with a multicenter study conducted in Iran which reported resistance rates exceeding 90% to aminoglycosides and monobactams among burn isolates (19).

Interestingly, meropenem exhibited a notably high sensitivity rate (93.8%) in this cohort, a finding that contrasts with several regional and global reports. For example, a 2025 surveillance study from Kuwait identified meropenem resistance rates nearing 76% among *P. aeruginosa* isolates from burn and ICU patients (20). This discrepancy could reflect differences in local antimicrobial stewardship practices, prescribing patterns, or prior exposure rates.

Fluoroquinolones such as ciprofloxacin (66.7%) and levofloxacin (58.3%) demonstrated moderate activity. While their efficacy remains variable across different burn centers, studies have shown that high fluoroquinolone resistance is often driven by overuse and rapid efflux mechanisms (21).

The relatively low sensitivity to piperacillin-tazobactam (37.5%) and cefepime (4.2%) observed in this study is also reflective of a broader trend. Several investigations, including a Spanish study in Microorganisms (2024), have shown that *P. aeruginosa* increasingly exhibits β-lactam resistance via AmpC overexpression and porin mutations, limiting the effectiveness of β-lactam/β-lactamase inhibitors (22).

Taken together, these findings underscore the urgency of performing routine antimicrobial susceptibility testing in burn patients. Given the highly adaptive nature of *P. aeruginosa* and its capacity to rapidly develop resistance mechanisms—such as efflux pumps, biofilm formation, and β-lactamase production—empirical therapy without culture guidance poses significant risks. The marked variation in drug effectiveness, especially for carbapenems and fluoroquinolones, further emphasizes the importance of localized surveillance data to inform treatment protocols and preserve the efficacy of critical antibiotics.

Limitation

There is a need to collect a larger number of *Pseudomonas aeruginosa* and *Acinetobacter baumannii* positive isolates from multiple governorates. Expanding the sample size would provide a more comprehensive understanding of the progression of these isolates' virulence potential in both hospital and community settings.

Conclusions

Pseudomonas aeruginosa emerged as the most prevalent pathogen among burn patients at Al-Nasiriyah Teaching Hospital, particularly during the third and fourth weeks of hospitalization. This period represented a critical window for infection control interventions.

Acinetobacter baumannii, while less frequent, showed a notable pattern of gender-based temporal distribution, with female patients more affected early during hospitalization and males predominating in the subsequent phase. Bloodstream infections were significantly associated with *P. aeruginosa* compared to *A. baumannii*, as confirmed by statistical analysis (Fisher's Exact Test, $p < 0.05$). Multidrug resistance was observed in both pathogens. *Acinetobacter* spp. showed 100% resistance to imipenem, tobramycin, and netilmicin, whereas *P. aeruginosa* demonstrated high resistance to tobramycin, netilmicin, ofloxacin, and aztreonam. Colistin and polymyxin B retained 100% effectiveness against both pathogens, reinforcing their role as last-resort antibiotics. The variability in antibiotic susceptibility patterns emphasizes the importance of localized resistance data and regular microbiological surveillance in burn units.

Recommendations

1. Implement intensified infection control measures during days 15 to 30 of hospitalization to reduce the risk of nosocomial infections.

2. Strengthen antibiotic stewardship programs to prevent the empirical overuse of broad-spectrum agents, particularly carbapenems and aminoglycosides.
3. Ensure routine antimicrobial susceptibility testing for all isolates to guide targeted therapy and reduce the risk of treatment failure.
4. Adopt early wound surveillance and decontamination protocols, especially within the first week of hospital admission.
5. Promote the use of colistin and polymyxin B cautiously and under strict clinical guidance to preserve their efficacy.
6 Invest in local epidemiological studies and resistance monitoring to inform clinical guidelines and public health policies for burn units.

Authors' declaration:
I confirm that all the Figures and Tables in the manuscript belong to the current study. Besides, the Figures and images, which do not belong to the current study, have been given permission for re-publication attached to the manuscript. Authors sign on ethical consideration's Approval-Ethical Clearance: The project was approved by the local ethical committee in (Ethical Committee, College of Nursing, University of Thi-Qar) according to the code number (Ref. No. 0125) on 20 December 2023.

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Data availability: Upon reasonable request, the corresponding author will make the data sets generated and/or analyzed during the current work available.

Authors' Contributions:
All contributions were undertaken by Khudher Kuraimsh Khudher: study conception and design; literature review; data acquisition and laboratory work; data analysis and interpretation; manuscript drafting; and manuscript editing and final approval.

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إنتشار عوامل مقاومة المضادات الحيوية بواسطة *Pseudomonas aeruginosa* و *Acinetobacter Baumannii* المعزولة من مرضى الحروق العراقيين في مستشفى الناصرية

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الخلفية :تؤدي إصابات الحروق إلى إضعاف الحاجز الجلدي وتهبيط الدفاعات المناعية، مما يجعل المرضى عرضة للإصابة بعدوى جراثيم سالبة الجرام انتهازية ومقاومة للأدوية .تؤكد هذه النتائج الحاجة الملحة إلى تبني استراتيجيات وقائية وعلاجية موجهة في وحدات رعاية الحروق.

الهدف :تقييم معدل الانتشار، وأنماط المقاومة للمضادات الحيوية، والأهمية السريرية لبكتيريا *P. aeruginosa* و *A. baumannii* لدى مرضى الحروق في مستشفى الناصرية التعليمي – العراق، مع التركيز على توقيت الإصابة، والاختلافات المرتبطة بالجنس، ومستويات المقاومة الدوائية.

الطريقة :أجريت دراسة مستقبلية وصفية خلال الفترة من نيسان 2024 إلى نيسان2025 ، حيث تم جمع 150 عينة سريرية من مرضى الحروق ومعالجتها وفقا للطرق الميكروبيولوجية القياسية .تم التعرف على العزلات وإجراء اختبار الحساسية للمضادات الحيوية وفقا لتعليمات CLSI. تم تحليل توقيت الإصابة، والبيانات السكانية، والعرض السريري لتحديد فترات الخطورة العالية والأنماط الوبائية.

النتائج :تم الحصول على 80 عزلة بكتيرية(n=48) *P. aeruginosa* :(n=19) *A. baumannii* ، و 13حالة عدوى مزدوجة .وظهر ارتفاع واضح في حالات *P. aeruginosa* خلال الفترة من اليوم 30–21 من الرقود في المستشفى، مما يشير إلى مرحلة حرجة لانتقال العدوى داخل المستشفى .ولوحظ اختلاف في نمط العدوى بـ *A. baumannii*بين الجنسين؛ حيث ظهرت الإصابة في الإناث مبكرا، بينما ظهرت في الذكور لاحقا خلال فترة الرقود .شكلت عدوى مجرى الدم 40% من الحالات، وكانت *P. aeruginosa* أكثر انتشارا بشكل معنوي من *A. baumannii* ($p<0.05$). أظهرت *A. baumannii* مقاومة تامة للإيميبينيم، والتوبراميسين، والنيتيلميسين، بينما أظهرت *P. aeruginosa* مقاومة بنسبة 100% للتوبراميسين والنيتيلميسين، وأكثر من 97% للأوفلوكساسين والأزتريونام .واحتفظ كلا الممرضين بحساسية كاملة للكوليستين والبوليميكسين.B

الاستنتاج :يواجه مرضى الحروق خطرا مرتفعا للإصابة بعدوى *P. aeruginosa* و *A. baumannii*متعددة المقاومة، خاصة خلال الأسبوعين الثالث والرابع من الرقود .تعد الاكتشاف المبكر، وتشديد إجراءات مكافحة العدوى، وترشيد استخدام المضادات الحيوية أمورا ضرورية لتحسين النتائج وخفض معدلات الوفيات في وحدات الحروق.

الكلمات المفتاحية :عدوى المستشفيات، مقاومة المضادات الحيوية، المتقلبة البومانية، الزائفة الزنجارية، مرضى الحروق.