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DEVICE-ASSOCIATED INFECTIONS IN AN INTENSIVE MEDICAL CARE UNIT: PREVALENCE, MICROBIOLOGICAL PROFILE, ANTIMICROBIAL SUSCEPTIBILITY PATTERNS, AND CLINICAL OUTCOMES—A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Device-associated infections (DAIs), including ventilator-associated pneumonia (VAP), central line-associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI), are major healthcare-associated infections contributing to increased morbidity, mortality, prolonged hospital stay, and antimicrobial resistance among critically ill patients. Continuous surveillance of these infections is essential for effective infection prevention and antimicrobial stewardship in intensive care units.
Aim: To determine the prevalence, microbiological profile, antimicrobial susceptibility patterns, and clinical outcomes of device-associated infections among patients admitted to an Intensive Medical Care Unit (IMCU).
Materials and Methods: This prospective observational study was conducted among 129 adult patients admitted to the IMCU who required invasive devices, including mechanical ventilation (n=46), central venous catheters (n=35), and urinary catheters (n=48). Patients were monitored for the development of device-associated infections according to standard surveillance criteria. Appropriate clinical specimens were cultured, microorganisms were identified using conventional microbiological techniques, and antimicrobial susceptibility testing was performed using the Kirby–Bauer disc diffusion method following Clinical and Laboratory Standards Institute guidelines.
Results: Overall, 41 (31.8%) patients developed device-associated infections. The prevalence was highest for VAP (20/46, 43.5%), followed by CAUTI (13/48, 27.1%) and CLABSI (8/35, 22.9%). Gram-negative bacilli predominated, with Klebsiella pneumoniae (29.3%) being the most frequently isolated pathogen, followed by Klebsiella oxytoca, Acinetobacter spp., and Citrobacter spp. Multidrug-resistant isolates accounted for 22.0% of culture-positive infections, with the highest proportion observed among VAP isolates (35.0%). Device-associated infections were associated with prolonged ICU stay and adverse clinical outcomes.
Conclusion: Device-associated infections remain a significant challenge among critically ill patients, with VAP being the most prevalent infection and Gram-negative bacilli predominating. Regular surveillance, strict adherence to infection prevention bundles, rational antimicrobial use, and antimicrobial stewardship programs are essential to reduce the burden of device-associated infections and limit the emergence of multidrug-resistant organisms.

Keywords: Device-associated infections; Ventilator-associated pneumonia; Central line-associated bloodstream infection; Catheter-associated urinary tract infection; Intensive care unit; Antimicrobial susceptibility; Multidrug-resistant organisms; Klebsiella pneumoniae.

INTRODUCTION

Device-associated infections (DAIs) are among the most common healthcare-associated infections (HAIs) occurring in intensive care units (ICUs), contributing substantially to patient morbidity, mortality, prolonged hospitalization, and increased healthcare costs. Critically ill patients frequently require invasive medical devices such as mechanical ventilators, central venous catheters, and urinary catheters for monitoring and life-sustaining therapy. Although indispensable in modern critical care, these devices disrupt normal host defense mechanisms and provide a portal of entry for microorganisms, predisposing patients to ventilator-associated pneumonia (VAP), central line-associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI). These infections not only complicate clinical management but also increase antimicrobial consumption and facilitate the emergence of multidrug-resistant (MDR) pathogens, thereby posing a major challenge to patient safety worldwide.[1-3]

Healthcare-associated infections affect hundreds of millions of patients globally every year, with the highest burden observed in low- and middle-income countries (LMICs). The World Health Organization (WHO) estimates that approximately 7% of hospitalized patients in high-income countries and nearly 15% in LMICs acquire at least one healthcare-associated infection during hospitalization. Intensive care units experience the greatest burden because of invasive procedures, prolonged hospital stays, critical illness, and extensive antimicrobial exposure. International surveillance studies conducted by the International Nosocomial Infection Control Consortium (INICC) have consistently demonstrated that device-associated infection rates in LMICs remain substantially higher than those reported by the United States National Healthcare Safety Network (NHSN), emphasizing the need for continuous surveillance and effective infection prevention strategies.[4-6]

Among device-associated infections, ventilator-associated pneumonia remains one of the leading causes of hospital-acquired infection in mechanically ventilated patients, accounting for significant mortality and prolonged ICU stay. Central line-associated bloodstream infections are associated with severe sepsis, increased healthcare expenditure, and higher mortality, whereas catheter-associated urinary tract infections constitute the largest proportion of device-related infections and frequently serve as reservoirs for antimicrobial-resistant organisms. Gram-negative bacilli, particularly Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Escherichia coli, have emerged as the predominant pathogens responsible for these infections in developing countries. The increasing prevalence of extended-spectrum β-lactamase (ESBL)-producing Enterobacterales and carbapenem-resistant organisms has further complicated empirical antimicrobial therapy and adversely affected clinical outcomes.[7-9]

Several surveillance studies have highlighted considerable geographic variation in the epidemiology and microbiological profile of device-associated infections. Rosenthal et al., through the INICC surveillance network involving hundreds of ICUs across developing countries, reported significantly higher rates of VAP, CLABSI, and CAUTI compared with those observed in developed healthcare settings.[6] Magill et al. described healthcare-associated infection patterns in the United States and emphasized that device-associated infections continue to represent a substantial proportion of preventable ICU infections despite advances in infection control practices.[10] In India, studies by Mehta et al., and Golia et al., have demonstrated that Gram-negative organisms predominate in ICU-acquired infections and frequently exhibit multidrug resistance, underscoring the importance of local microbiological surveillance to guide empirical antibiotic therapy and antimicrobial stewardship programs.[11,12]

The epidemiology of device-associated infections varies considerably among hospitals because of differences in patient characteristics, infection prevention practices, antimicrobial prescribing patterns, and local microbial ecology. Consequently, institution-specific surveillance is essential for identifying prevalent pathogens, monitoring antimicrobial susceptibility trends, evaluating infection control measures, and formulating evidence-based empirical treatment protocols. Although national and international surveillance data are available, published evidence from many tertiary care hospitals in South India remains limited, and periodic updates are necessary because antimicrobial resistance patterns change rapidly over time.

Therefore, the present prospective observational study was undertaken to determine the prevalence of ventilator-associated pneumonia, central line-associated bloodstream infection, and catheter-associated urinary tract infection among patients admitted to the Intensive Medical Care Unit of a tertiary care teaching hospital. The study also aimed to characterize the microbiological profile of device-associated infections, evaluate antimicrobial

susceptibility patterns of the isolated pathogens, and assess their clinical implications. The findings are expected to provide institution-specific epidemiological data that will strengthen infection prevention strategies, optimize empirical antimicrobial therapy, support antimicrobial stewardship initiatives, and ultimately improve patient outcomes in critically ill populations.

Aim

To evaluate the burden of device-associated infections by determining their prevalence, causative microorganisms, antimicrobial susceptibility patterns, and associated clinical outcomes among critically ill patients admitted to an Intensive Medical Care Unit.

Objectives

1. To estimate the prevalence of ventilator-associated pneumonia, central line-associated bloodstream infection, and catheter-associated urinary tract infection among Intensive Medical Care Unit patients.
2. To characterize the microbiological spectrum of device-associated infections and determine the antimicrobial susceptibility patterns of the isolated pathogens.
3. To evaluate the clinical implications of device-associated infections by assessing associated risk factors, multidrug-resistant organism prevalence, length of hospital stay, and patient mortality.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted over a period of **12 months**, from **March 2023 to February 2024**, in the **15-bedded Intensive Medical Care Unit (IMCU) of Government Thoothukudi Medical College Hospital, Thoothukudi, Tamil Nadu, India**. The study was designed to determine the prevalence of device-associated infections (DAIs), identify the causative microorganisms, evaluate antimicrobial susceptibility patterns, and assess the associated clinical outcomes among critically ill patients requiring invasive medical devices.

Study Population

The study included adult patients admitted to the IMCU who required one or more invasive medical devices, namely mechanical ventilation, central venous catheterization, or indwelling urinary catheterization. Patients were prospectively monitored throughout their ICU stay for the development of device-associated infections occurring after the recommended surveillance period. A total of **129 patients** were included in the study, comprising **46 mechanically ventilated patients, 35 patients with central venous catheters, and 48 patients with indwelling urinary catheters**.

Eligibility Criteria

Inclusion Criteria

Patients were eligible for inclusion if they fulfilled the following criteria:

- Age **18 years or older**.
- Admitted to the IMCU during the study period.
- Patients with an indwelling urinary catheter for **more than 48 hours** who developed symptoms suggestive of urinary tract infection during catheterization or within **48 hours after catheter removal**.
- Patients with a central venous catheter who developed signs or symptoms of bloodstream infection **48 hours after catheter insertion** or within **48 hours following catheter removal**.
- Patients receiving invasive mechanical ventilation who developed clinical features suggestive of ventilator-associated pneumonia **after 48 hours of endotracheal intubation** or within **48 hours after extubation**.
- Patients with tracheostomy connected to mechanical ventilation were also included.

Exclusion Criteria

The following patients were excluded from the study:

- Patients younger than 18 years.
- Patients with evidence of active infection at the time of ICU admission.
- Patients with urosepsis, recurrent urinary tract infection, or recent urogynecological procedures.
- Patients with urinary stents, nephrostomy tubes, suprapubic catheters, organ transplantation, or those undergoing dialysis during admission.
- Patients with pre-existing chronic lower respiratory tract diseases including pulmonary tuberculosis, chronic obstructive pulmonary disease, bronchial asthma, or acute respiratory distress syndrome.
- Patients receiving non-invasive ventilation alone.
- Patients receiving chemotherapy or immunosuppressive therapy.
- Patients who did not provide informed consent.

Diagnostic Criteria

Device-associated infections were diagnosed using standard **Centers for Disease Control and Prevention/National Healthcare Safety Network (CDC/NHSN)** surveillance definitions.

- **Ventilator-associated pneumonia (VAP)** was diagnosed in patients receiving invasive mechanical ventilation for at least 48 hours who developed new or progressive pulmonary infiltrates on chest imaging together with clinical evidence such as fever, leukocytosis or leukopenia, purulent respiratory secretions, and microbiological confirmation from respiratory specimens.
- **Central line-associated bloodstream infection (CLABSI)** was defined as laboratory-confirmed bloodstream infection occurring in patients with a central venous catheter that had been in place

for at least 48 hours, without another identifiable source of infection.

- **Catheter-associated urinary tract infection (CAUTI)** was diagnosed in patients with indwelling urinary catheters present for at least 48 hours who developed compatible urinary symptoms and a positive urine culture according to CDC/NHSN criteria.

Data Collection

Demographic characteristics, clinical diagnosis, duration of device use, clinical features suggestive of infection, microbiological findings, antimicrobial susceptibility reports, and patient outcomes were recorded prospectively using a structured case record form.

The following variables were collected:

- Age and sex
- Primary diagnosis
- Duration of mechanical ventilation, central venous catheterization, or urinary catheterization
- Clinical signs and symptoms suggestive of infection
- Laboratory and microbiological findings
- Culture positivity
- Organisms isolated
- Antimicrobial susceptibility profile
- Presence of multidrug-resistant organisms
- Clinical outcome including prolonged ICU stay and mortality, wherever applicable.

Microbiological Methods

Appropriate clinical specimens were collected under strict aseptic precautions before initiation or modification of antimicrobial therapy.

- Endotracheal aspirates were collected from patients suspected of VAP.
- Peripheral blood samples were obtained from patients with suspected CLABSI.
- Midstream urine or catheter urine samples were collected from patients with suspected CAUTI.

Samples were processed in the Department of Microbiology using standard microbiological techniques. Organisms were identified by conventional culture methods, colony morphology, Gram staining, and biochemical identification procedures. Antimicrobial susceptibility testing was performed using the **Kirby–Bauer disc diffusion method** on Mueller–Hinton agar according to the **Clinical and Laboratory Standards Institute (CLSI)** guidelines applicable during the study period.

Multidrug resistance was defined as resistance to at least one antimicrobial agent in three or more antimicrobial classes.

Outcome Measures

The primary outcome was the prevalence of device-associated infections among patients exposed to invasive devices.

Secondary outcomes included:

- Distribution of causative microorganisms.
- Antimicrobial susceptibility patterns.
- Prevalence of multidrug-resistant organisms.
- Clinical outcomes including prolonged ICU stay and in-hospital mortality.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) software (IBM SPSS Statistics, version 26.0 or later). Continuous variables were summarized as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on data distribution. Categorical variables were expressed as frequencies and percentages.

The prevalence of VAP, CLABSI, and CAUTI was calculated as the proportion of culture-confirmed infections among patients exposed to each respective device. Microbiological isolates and antimicrobial susceptibility patterns were described using descriptive statistics. Results are presented as frequencies, percentages, tables, and appropriate graphical representations. A two-sided **p-value <0.05** was considered statistically significant for inferential analyses, where applicable.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Approval was obtained from the **Institutional Ethics Committee of Government Thoothukudi Medical College Hospital** before commencement of the study. Written informed consent was obtained from patients or their legally authorized representatives prior to enrollment. Patient confidentiality and anonymity were maintained throughout the study.

RESULTS

A total of 129 critically ill patients with indwelling medical devices were included in the study, comprising 46 patients on mechanical ventilation, 35 with central venous catheters, and 48 with indwelling urinary catheters. The mean age of patients ranged from 50.2 ± 13.7 to 52.3 ± 12.9 years across the three device groups, with a predominance of males (63.0%–77.1%). The mean duration of device utilization was comparable among the groups, varying from 6.4 ± 2.2 to 6.9 ± 1.1 days, and the majority of devices remained in situ for 5–10 days.

Table 1: Baseline Characteristics of the Study Population

Variable	VAP Group (n=46)	CLABSI Group (n=35)	CAUTI Group (n=48)
Mean age (years)	50.2 ± 13.7	51.4 ± 11.6	52.3 ± 12.9
Male sex, n (%)	29 (63.0)	27 (77.1)	34 (70.8)
Mean duration of device use (days)	6.8 ± 1.5 (Ventilator)	6.9 ± 1.1 (Central line)	6.4 ± 2.2 (Urinary catheter)
Device duration 5–10 days, n (%)	41 (89.1)	34 (97.1)	35 (72.9)

Among the 129 patients, 41 developed culture-confirmed device-associated infections, yielding an overall prevalence of 31.8%. Ventilator-associated pneumonia (VAP) was the most frequent infection, occurring in 20 of 46 ventilated patients (43.5%), followed by catheter-associated urinary tract infection (CAUTI) in 13 of 48 patients (27.1%) and central line-associated bloodstream infection (CLABSI) in 8 of 35 patients (22.9%). When considered across the entire study population, VAP accounted for 15.5% of cases, CAUTI for 10.1%, and CLABSI for 6.2%.

Table 2: Prevalence of Device-Associated Infections

Device-associated infection	Patients with Device n	Positive Cases, n (%)a	Overall Frequency, n (%)b	Predominant Organisms
Ventilator-associated pneumonia (VAP)	46	20 (43.5)	20 (15.5)	*Klebsiella pneumoniae*, *Klebsiella oxytoca*
Central line-associated bloodstream infection (CLABSI)	35	8 (22.9)	8 (6.2)	*Citrobacter* spp., *Acinetobacter* spp.
Catheter-associated urinary tract infection (CAUTI)	48	13 (27.1)	13 (10.1)	*Klebsiella pneumoniae*, *Klebsiella oxytoca*
Overall	**129**	**41 (31.8)**	**41 (31.8)**	Predominantly Gram-negative bacilli

Gram-negative bacilli constituted the predominant pathogens isolated from all device-associated infections. Klebsiella pneumoniae was the most common organism overall, accounting for 12 (29.3%) isolates, followed by Klebsiella oxytoca, Acinetobacter spp., and Citrobacter spp., each contributing 6 (14.6%) isolates. Within the VAP group, Klebsiella pneumoniae (40.0%) was the predominant isolate, whereas Citrobacter spp. (37.5%) and Acinetobacter spp. (25.0%) were more frequently isolated in CLABSI. In CAUTI, Klebsiella pneumoniae remained the leading pathogen (23.1%), followed by Klebsiella oxytoca (15.4%). Pseudomonas aeruginosa, Escherichia coli, and Enterococcus spp. were isolated less frequently.

Table 3: Microbiological Profile of Device-Associated Infections (n = 41)

Microorganism	VAP (n = 20) n (%)	CLABSI (n = 8) n (%)	CAUTI (n = 13) n (%)	Total (n = 41) n (%)
Klebsiella pneumoniae	8 (40.0)	1 (12.5)	3 (23.1)	12 (29.3)
Klebsiella oxytoca	4 (20.0)	0 (0.0)	2 (15.4)	6 (14.6)
Acinetobacter spp.	4 (20.0)	2 (25.0)	0 (0.0)	6 (14.6)
Citrobacter spp.	2 (10.0)	3 (37.5)	1 (7.7)	6 (14.6)
Pseudomonas aeruginosa	1 (5.0)	1 (12.5)	1 (7.7)	3 (7.3)
Escherichia coli	0 (0.0)	0 (0.0)	1 (7.7)	1 (2.4)
Enterococcus spp.	0 (0.0)	0 (0.0)	1 (7.7)	1 (2.4)
Other organisms	1 (5.0)	1 (12.5)	4 (30.8)	6 (14.6)
Total	20 (100.0)	8 (100.0)	13 (100.0)	41 (100.0)

Assessment of antimicrobial resistance demonstrated that 9 (22.0%) of the 41 isolates were multidrug resistant and resistant to all tested antibiotics. Multidrug resistance was most commonly observed among VAP isolates (7/20, 35.0%), followed by CAUTI isolates (2/13, 15.4%), while no multidrug-resistant isolate was documented among CLABSI isolates. Overall, 32 (78.0%) isolates remained susceptible to one or more tested antimicrobial agents.

Table 4: Antimicrobial Resistance Pattern of Culture-Positive Isolates

Antimicrobial Pattern	VAP (n = 20)	CLABSI (n = 8)	CAUTI (n = 13)	Total (n = 41)
Resistant to all tested antibiotics (MDR), n (%)	7 (35.0)	0 (0.0)*	2 (15.4)	9 (22.0)
Susceptible to one or more tested antibiotics, n (%)	13 (65.0)	8 (100.0)*	11 (84.6)	32 (78.0)

**** No multidrug-resistant isolate was specifically reported for CLABSI in the available results.***

Clinical evaluation revealed that all patients with device-associated infections experienced prolonged Intensive Medical Care Unit stay. Poisoning was the most common underlying diagnosis among patients with VAP, whereas cardiogenic shock/coronary artery disease predominated in CLABSI and coronary artery disease with left ventricular failure was frequently associated with CAUTI. Diabetes mellitus was documented in five (62.5%) patients with CLABSI. Across all infection categories, Gram-negative bacilli remained the predominant pathogen group, emphasizing their major contribution to device-associated infections in critically ill patients.

Table 5: Clinical Characteristics and Outcomes of Patients with Device-Associated Infections (n = 41)

Variable	VAP (n = 20)	CLABSI (n = 8)	CAUTI (n = 13)	Total (n = 41)
Culture-positive patients, n (%)	20 (48.8)	8 (19.5)	13 (31.7)	41 (100.0)
Most common associated diagnosis	Poisoning	Cardiogenic shock / CAD	CAD / LV failure	—
Diabetes mellitus, n (%)	NR	5 (62.5)	NR	5 (12.2)

Predominant pathogen group	Gram-negative bacilli	Gram-negative bacilli	Gram-negative bacilli	Gram-negative bacilli
Increased ICU stay, n (%)	20 (100.0)	8 (100.0)	13 (100.0)	41 (100.0)
Mortality attributable to DAI, n (%)	NR	NR	NR	NR

Abbreviations: CAD – Coronary artery disease; LV – Left ventricular failure; NR – Not reported.

DISCUSSION

The present prospective observational study evaluated the prevalence, microbiological profile, antimicrobial susceptibility patterns, and clinical outcomes of device-associated infections (DAIs) among patients admitted to an intensive medical care unit. Of the 129 patients included, 41 (31.8%) developed culture-confirmed device-associated infections, with ventilator-associated pneumonia (VAP) being the most common infection (43.5%), followed by catheter-associated urinary tract infection (CAUTI) (27.1%) and central line-associated bloodstream infection (CLABSI) (22.9%). These findings underscore the substantial burden of healthcare-associated infections in critically ill patients requiring invasive devices.

The highest prevalence observed in the present study was VAP (43.5%), which is consistent with the findings of Joseph et al., who reported VAP as the most frequent intensive care unit-acquired infection in Indian ICUs, with prolonged mechanical ventilation being a major predisposing factor.[13] Similarly, Mehta et al., in the International Nosocomial Infection Control Consortium (INICC) surveillance study involving Indian intensive care units, demonstrated that VAP accounted for the majority of device-associated infections, with rates considerably higher than those reported in developed countries.[14] Although the prevalence in the present study is slightly higher than that reported in some tertiary care centres, the difference may be attributed to variations in patient characteristics, severity of illness, infection control practices, and duration of device utilization.

Among culture-positive isolates, Gram-negative bacilli predominated, accounting for the majority of infections. Klebsiella pneumoniae was the most frequently isolated pathogen (29.3%), followed by Klebsiella oxytoca, Acinetobacter species, and Citrobacter species. Similar microbiological profiles have been reported by Golia et al., who identified Klebsiella pneumoniae and Acinetobacter baumannii as the predominant pathogens responsible for healthcare-associated infections in intensive care settings.[12] Likewise, Gupta et al. demonstrated that multidrug-resistant Gram-negative organisms were responsible for the majority of VAP and urinary tract infections among critically ill patients.[15] The predominance of Gram-negative organisms in the present study reflects the changing epidemiology of intensive care unit infections in developing countries and emphasizes the need for continuous microbiological surveillance.

The microbiological distribution also varied according to the type of device-associated infection. Klebsiella pneumoniae predominated among VAP and CAUTI isolates, whereas Citrobacter species and Acinetobacter species were more frequently associated with CLABSI. Similar pathogen-specific trends have been described by Rosenthal et al. through the INICC surveillance network, where Enterobacterales and non-fermenting Gram-negative bacilli were identified as the leading causes of device-associated infections across low- and middle-income countries. These similarities reinforce the importance of local antibiograms for guiding empirical antimicrobial therapy.[16]

An important observation in the present study was the occurrence of multidrug-resistant (MDR) organisms in 22.0% of culture-positive isolates, with the highest proportion among VAP isolates (35.0%). Comparable findings were reported by Magill et al., who observed that antimicrobial resistance remains one of the most important challenges in intensive care units, contributing to increased treatment failure, prolonged hospitalization, and higher healthcare costs. The predominance of MDR organisms among ventilated patients may be explained by prolonged exposure to broad-spectrum antibiotics and longer duration of intensive care stay.[10]

Despite the presence of multidrug-resistant isolates, most organisms remained susceptible to at least one antimicrobial agent, highlighting the importance of culture-guided therapy. Similar conclusions were drawn by the World Health Organization and numerous antimicrobial stewardship studies, which recommend routine microbiological surveillance and institution-specific antibiograms to optimize empirical antibiotic selection and reduce the emergence of resistance.[17]

The present study also demonstrated that device-associated infections were associated with adverse clinical outcomes, including prolonged intensive care unit stay. Although mortality attributable to individual infections was not quantified, previous studies consistently demonstrate that DAIs substantially increase morbidity, mortality, and healthcare expenditure. Zimlichman et al. estimated that healthcare-associated infections significantly prolong hospitalization and contribute to increased mortality among critically ill patients.[18] Likewise, Vincent et al. reported that patients developing ICU-acquired infections had significantly worse clinical outcomes than uninfected patients, emphasizing the importance of preventive strategies such as hand hygiene, device-care bundles, antimicrobial

stewardship, and early removal of invasive devices.[19]

Overall, the findings of the present study are consistent with published literature demonstrating that VAP remains the most common device-associated infection, Gram-negative bacilli continue to predominate, and multidrug-resistant organisms pose a significant therapeutic challenge in intensive care units. Continuous surveillance, strict adherence to infection prevention bundles, rational antimicrobial prescribing, and periodic evaluation of institutional antibiograms remain essential strategies for reducing the burden of device-associated infections and improving patient outcomes.

Limitations

This study was conducted in a single tertiary care Intensive Medical Care Unit with a relatively small sample size, which may limit the generalizability of the findings to other healthcare settings. The study included only culture-confirmed device-associated infections and did not evaluate molecular mechanisms of antimicrobial resistance or perform genotypic characterization of multidrug-resistant organisms. Additionally, detailed analysis of independent risk factors, duration of ICU stay, and attributable mortality for each infection type was limited. Long-term patient outcomes following hospital discharge were also not assessed.

CONCLUSION

The present study demonstrated that device-associated infections remain a significant cause of morbidity among critically ill patients, with an overall prevalence of 31.8%. Ventilator-associated pneumonia was the most common device-associated infection, while Gram-negative bacilli, particularly Klebsiella pneumoniae, predominated among the isolated pathogens. Although most isolates remained susceptible to at least one antimicrobial agent, multidrug-resistant organisms were identified in nearly one-fourth of culture-positive isolates, highlighting the growing challenge of antimicrobial resistance in intensive care settings. These findings emphasize the importance of continuous microbiological surveillance, strict adherence to infection prevention bundles, rational antimicrobial stewardship, and regular monitoring of institutional antibiograms to reduce the burden of device-associated infections and improve patient outcomes.

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