ANNUAL AMR SURVEILLANCE

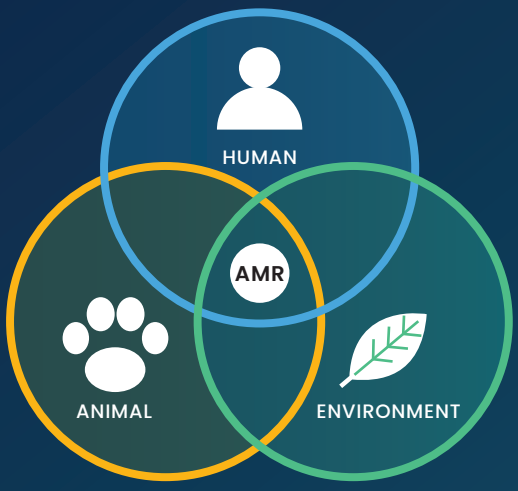
Clinical Isolates • Antibiogram • Trends

# ANTIMICROBIAL RESISTANCE REPORT 2025–2026

Annual Antimicrobial Resistance Data
July 2025 – June 2026

**ONE HEALTH**

HUMAN • ANIMAL • ENVIRONMENT






WORLD AMR AWARENESS WEEK 2026 | 18-24 NOVEMBER

## One Health, One Action: Prevent AMR Now

Department of Microbiology & Immunology
**Bangladesh Medical University**

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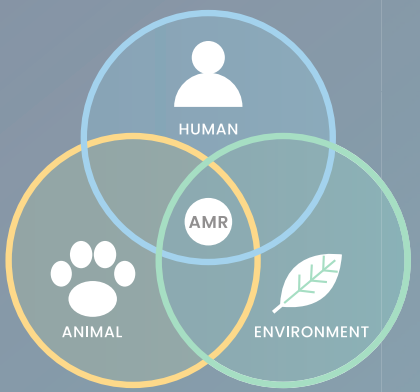
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Department of Microbiology & Immunology
**Bangladesh Medical University**

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# ANNUAL AMR DATA

## JULY 2025 - JUNE 2026

# Preface

Antimicrobial Resistance (AMR) in human health is a critical and escalating crisis and this renders standard treatments ineffective, allowing infections to persist and spread, with severe consequences for individual patients and public health systems worldwide. It is a silent pandemic that is already here, undermining a century of medical progress.

The natural process of AMR is dramatically accelerated by human activity. Inappropriate prescribing, patient demand, self-medication along with inadequate dosage are the key factors contributing to the development of AMR. Clinical overuse of antimicrobial agents is the primary driver in healthcare settings. The prescription of broad-spectrum antibiotics, often without diagnostic confirmation, fuels resistance. Hospitals are hotspots for resistant pathogens (like MRSA, VRE and CRE). Vulnerable patients with weakened immune systems are easy targets and the close quarters facilitate spread. Resistant organisms know no borders. A resistant infection acquired in one hospital or area can be transported to another within very short time by the infected patients. In areas with poor sanitation, limited access to clean water and inadequate healthcare, infectious diseases are more common. This can lead to unregulated antibiotic use, while simultaneously, a lack of access to appropriate antibiotics means infections go untreated, allowing them to spread and potentially develop resistance.

The consequences of rapidly rising AMR are affecting human health harshly in different ways. Common infections like pneumonia, sepsis, tuberculosis and sexually transmitted diseases are becoming harder and sometimes impossible to treat, leading to higher death rates. Infections last longer, increasing the patient's suffering and risk of complications. Cancer chemotherapy, organ transplantation, major surgeries and intensive care outcomes are under enormous threat due to emerging AMR. Resistant infections require longer hospital stays, more expensive and often toxic second- or third-line drugs and intensive care, placing a massive financial burden on families and health systems.

The fight against AMR in human health is shifting from mere awareness to urgent strategic action. The current priorities are Antimicrobial Stewardship Programs (ASPs), which include ensuring the right drug, dose and duration are selected for each patient. The most effective way to reduce antibiotic use is to prevent infections in the first place. This includes vaccination and Infection Prevention and Control (IPC) in hospitals and clinics. It also include pushing for the use of rapid diagnostic tests to quickly identify the causative organism and its resistance profile, allowing for targeted, effective therapy instead of empirical use of antimicrobial agents. There is an urgent need to develop new antimicrobials, while also ensuring they are used responsibly and remain accessible.

As we look to the future, we must continue working together with relevant stakeholders to address the multifaceted challenges posed by AMR. The findings presented in this report will serve not only as a reflection of our current state but also as a guide for strategic interventions by developing appropriate policies and guidelines to combat AMR.

# Acknowledgement

This report was developed by the Department of Microbiology & Immunology at Bangladesh Medical University. It was coordinated, written and compiled by the following faculty members: Prof. Abu Naser Ibne Sattar, Dr. Sanjida Khondakar Setu, Dr. Shaheda Anwar, Dr. Rehana Razzak Khan Ahmed, Dr. Ismet Nigar and Dr. SM Ali

We would like to acknowledge the invaluable contributions of the MD Residents and Laboratory Technologists of the Microbiology Culture Lab, who assisted in data collection and compilation under the direct supervision of the faculty members.

# Acronyms

| | |
|---|---|
| AFST | Antifungal Susceptibility Testing |
| AMC | Amoxicillin–Clavulanic acid |
| AMR | Antimicrobial Resistance |
| AST | Antimicrobial Susceptibility Testing |
| BAL | Bronchoalveolar Lavage |
| BMD | Broth Microdilution |
| CLSI | Clinical and Laboratory Standards Institute |
| CoNS | Coagulase-Negative Staphylococci |
| CRAB | Carbapenem-Resistant Acinetobacter baumannii |
| CRE | Carbapenem-Resistant Enterobacterales |
| CRPA | Carbapenem-Resistant Pseudomonas aeruginosa |
| CSF | Cerebrospinal Fluid |
| CVC | Central Venous Catheter |
| DNA | Deoxyribonucleic Acid |
| E. coli | Escherichia coli |
| EQAS | External Quality Assessment Scheme |
| ESBL | Extended-Spectrum β-Lactamase |
| ETT | Endotracheal Tube |
| EUCAST | European Committee on Antimicrobial Susceptibility Testing |
| GNB | Gram-Negative Bacilli |
| GPC | Gram-Positive Cocci |
| HIS | Hospital Information System |
| HVS | High Vaginal Swab |
| ICU | Intensive Care Unit |
| IPC | Infection Prevention and Control |
| IPD | Inpatient Department |
| LIS | Laboratory Information System |
| MIC | Minimum Inhibitory Concentration |
| MRSA | Methicillin-Resistant Staphylococcus aureus |
| NAC | Non-albicans Candida |
| NICU | Neonatal Intensive Care Unit |
| OPD | Outpatient Department |
| OSBF | Other Sterile Body Fluids |
| PICU | Pediatric Intensive Care Unit |
| PIP-TAZ / TPZ | Piperacillin–Tazobactam |
| SOP | Standard Operating Procedure |
| SOSA | Staphylococcus other than S. aureus |
| TGC | Tigecycline |
| TMP-SMX | Trimethoprim–Sulfamethoxazole |
| UNK | Unknown |
| VISA | Vancomycin-Intermediate S. aureus |
| VRE | Vancomycin-Resistant Enterococcus species |
| VRSA | Vancomycin-Resistant S. aureus |
| WHO | World Health Organization |

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# Executive Summary

Antimicrobial resistance (AMR) is jeopardizing the effectiveness of life-saving treatments, creating a serious and expanding threat to global health. It undermines the core of modern medicine, making previously treatable infections more difficult or impossible to manage. Initiatives that strengthen the evidence on AMR by standardizing data collection, analysis, sharing and reporting enable a more coordinated response to tackle AMR effectively.

This report includes the antimicrobial susceptibility pattern of the bacteria and fungi isolated from various clinical samples at the Department of Microbiology & Immunology, Bangladesh Medical University, for the reporting period of July 2025 to June 2026. The report provides insights into the resistance pattern, the trends of multidrug resistance and emerging resistance across the samples of the University outpatient and inpatient departments. Standard operating procedures (SOPs) for organism identification, antimicrobial susceptibility testing, defining multidrug resistance and the phenotypic and genotypic detection of multidrug resistance are followed in this laboratory.

The panel of antimicrobials used for diagnosis is standardized in alignment with the CLSI (Clinical and Laboratory Standards Institute). Culture and antibacterial susceptibility testing are performed using both conventional and automated methods; from this year, blood culture data are presented separately for the automated and the conventional systems. Colistin susceptibility is determined by broth microdilution (BMD) and MIC reports are provided with each report. Monthly data-quality monitoring calls, participation in the External Quality Assessment Scheme (EQAS) and internal quality control for culture and susceptibility testing continued to support data quality.

**The Key Findings of This Report Are:**

- Over the years, the number of processed specimens has steadily increased – from 32,686 in 2022 and 46,279 in 2024-25 to **50,844** in the current reporting period. Of these, **13,252 (26.1%)** yielded culture-positive bacterial isolates. A total of 17,138 urine samples were cultured, of which 6,445 (37.6%) were culture-positive, and 16,904 blood cultures (6,661 automated and 10,243 conventional) yielded 1,357 bacterial isolates (8%).
- Urine contributed the largest share of isolates (48.6%), followed by wound swab (16.1%), blood (10.2%) and sputum (9.7%).
- The most commonly isolated priority pathogen in urine was *E. coli* (50.6%), similar to the previous four years, followed by *Klebsiella* spp. (18.3%) and *Enterococcus* spp. (10.8%).
- In blood, *Klebsiella* spp. (18.6%) followed by *S. aureus* (14.2%) and *Salmonella* Typhi and Paratyphi (13.5%).
- In wound swabs the most frequently isolated pathogen was *Pseudomonas* spp. (40.9%) followed by *Klebsiella* spp. (29.3%), whereas in respiratory samples *Klebsiella* spp. predominated (74.9% of sputum isolates).
- *Salmonella enterica* serovar Typhi (142 isolates) showed 50% resistance to ciprofloxacin (40.3% in 2024-25) and 69.7% to nalidixic acid, while resistance to cotrimoxazole (12%) and chloramphenicol (14.9%) remained low. 5 isolates were resistant to ceftriaxone (four in 2024-25).
- Carbapenem (meropenem) resistance in blood isolates was 56% in *Klebsiella* spp., 62.2% in *Acinetobacter* spp., 33.3% in *E. coli* and 24.2% in *Pseudomonas* spp.
- In urine, *E. coli* showed high resistance to ciprofloxacin (75.5%), ceftriaxone (62.2%) and

gentamicin (52.9%); nitrofurantoin resistance rose to 50.1% (33.3% in 2024-25) and meropenem resistance to 18.4% (12.5%).

- Colistin resistance remained low overall (0.4% of *Klebsiella* spp. and 0.8% of *Acinetobacter* spp. across all specimens) but was detected in blood isolates of *Klebsiella* spp. (3.6%) and *Acinetobacter* spp. (3.1%).
- MRSA (cefoxitin-resistant *S. aureus*) from pus, wound, nasal and aural swabs increased from 19.2% (2024-25) to **26.3%**; across all specimen types 257 of 1,133 *S. aureus* (22.7%) were MRSA.
- Vancomycin resistance was reported in urinary isolates of *S. aureus* (12 isolates, 2.3%) and *Enterococcus* spp. (13 isolates, 1.9%), together with 13 linezolid-resistant urinary *S. aureus*. These isolates require confirmation by MIC-based methods and molecular testing.
- ESBL-producing *E. coli* from urine decreased from 194 (3.16%) in 2024-25 to 176 (2.7%).
- Carbapenem resistance continued to climb: 3,810 of 10,536 major Gram-negative isolates (36.2%) were meropenem-resistant (28.2% in 2024-25), including 40% of *Klebsiella* spp., 20.7% of *E. coli*, 52.1% of *Pseudomonas* spp. and 57.5% of *Acinetobacter* spp. Resistance exceeded 95% in *Klebsiella* and *Acinetobacter* from tracheal aspirates, which is of great concern and is consistent with carbapenems being used as first-line agents for inpatients and in the ICU.
- *Candida albicans* and *C. tropicalis* (22 isolates each, 28.95%) were the most frequent yeasts in blood, followed by a marked rise in *C. ciferrii* (18 isolates, 23.7%). Fluconazole resistance was highest in *C. ciferrii* (72.2%), followed by *C. parapsilosis* (37.5%), *C. albicans* (31.8%) and *C. tropicalis* (18.2%); micafungin resistance was not detected in any species.

As in previous years, the AMR data in this report have the limitation that the sample source (IPD, OPD and emergency) could not be segregated for culture and sensitivity samples, and demographic and antibiotic-history data are lacking in the absence of an effective HIS and LIS. This limitation could potentially distort the AMR trends and may make them appear higher than they actually are.

This report highlights the urgent need to strengthen surveillance systems, implement targeted interventions, develop evidence-based policies and maintain sustained collaborations and investments to combat antimicrobial resistance (AMR). The AMR data presented here are a critical resource for policymakers, healthcare professionals and researchers working to address the escalating threat of AMR.

# AMR Data

## Important findings



## Findings

**Table 1:** Distribution of the pathogens isolated from the specimen type (N=50,844)

| Samples | Total number of samples | Culture positive | % of growth |
|---|---|---|---|
| **Urine** | 17,138 | 6,445 | 37.6 |
| **Blood culture (automated + conventional)** | 16,904 | 1,357 | 8.0 |
| **Sputum** | 4,609 | 1,280 | 27.8 |
| **Tracheal aspirate** | 732 | 511 | 69.8 |
| **Pus** | 2,122 | 867 | 40.9 |
| **Wound swab** | 3,636 | 2,132 | 58.6 |
| **Throat swab** | 426 | 176 | 41.3 |
| **Nasal swab** | 64 | 11 | 17.2 |
| **BAL** | 429 | 197 | 45.9 |
| **Others*** | 4,784 | 276 | 5.8 |

**Others: CSF, Ascitic Fluid, Aural Swab, Oral Swab, Bile, Conjunctival Swab, Nipple Discharge, Pleural Fluid, Prostatic Smear, High Vaginal Swab, Endotracheal Tube, Central Venous Catheter, Urinary Catheter Tip, Stent, Urethral Discharge, Synovial Fluid, Stool. Total number of samples processed in 2025-26: 50,844; culture positive: 13,252 (26.1%).*

The analysis of 2025-2026 AMR data revealed that the highest proportion of isolates was from urine specimens (48.6%), followed by wound swabs (16.1%), blood (10.2%) and sputum (9.7%). The highest rates of culture positivity were observed in tracheal aspirates (69.8%) and wound swabs (58.6%).

## Priority Pathogens

**Table 2:** Priority pathogens and specimens in the last one year

| Specimen | *Staph. aureus* | *Enterococcus* spp. | *Klebsiella* spp. | *E. coli* | *Acinetobacter* spp. | *Pseudomonas* spp. | *Salmonella Typhi/ Paratyphi* |
|---|---|---|---|---|---|---|---|
| **Blood** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Urine** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Pus/Wound swab** | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| **Other sterile body fluid** | ✓ | | ✓ | ✓ | ✓ | ✓ | |

Seven priority bacterial pathogens are monitored, namely *Staphylococcus aureus*, *Enterococcus* species, *Escherichia coli*, *Klebsiella* species, *Pseudomonas* species, *Acinetobacter* species and *Salmonella enterica* serovar Typhi and Paratyphi. These pathogens were also the most frequently isolated in the laboratory for the last few years (✓ = isolated from the specimen during 2025-26).

**Table 3:** Specimen-wise distribution of bacterial isolates (N=13,252)

| Priority pathogens | Blood | | Urine | | Pus/ W/S | | Resp. samples* | | Body fluid** | | Others | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % | N | % |
| *S. aureus* | 193 | 14.2 | 522 | 8.1 | 482 | 16.1 | 9 | 0.4 | 1 | 0.9 | 23 | 15.6 |
| *Enterococcus* spp. | 6 | 0.4 | 696 | 10.8 | - | - | - | - | - | - | - | - |
| *Escherichia coli* | 60 | 4.4 | 3260 | 50.6 | 264 | 8.8 | 5 | 0.2 | 27 | 24.1 | 15 | 10.2 |
| *Klebsiella* spp. | 252 | 18.6 | 1182 | 18.3 | 897 | 29.9 | 1642 | 74.9 | 44 | 39.3 | 57 | 38.8 |
| *Salmonella Typhi and Paratyphi* | 183 | 13.5 | 2 | 0.0 | - | - | - | - | - | - | - | - |
| *Pseudomonas* spp. | 99 | 7.3 | 327 | 5.1 | 1032 | 34.4 | 284 | 13.0 | 25 | 22.3 | 32 | 21.8 |
| *Acinetobacter* spp. | 127 | 9.4 | 141 | 2.2 | 227 | 7.6 | 244 | 11.1 | 14 | 12.5 | 19 | 12.9 |
| Others | 437 | 32.2 | 315 | 4.9 | 97 | 3.2 | 8 | 0.4 | 1 | 0.9 | 1 | 0.7 |
| **Total** | **1,357** | **100.0** | **6,445** | **100.0** | **2,999** | **100.0** | **2,192** | **100.0** | **112** | **100.0** | **147** | **100.0** |

**Resp. samples: Sputum, Tracheal Aspirate, Throat Swab, Bronchoalveolar Lavage, Endotracheal Tube. **Body fluid: CSF, Pleural Fluid, Ascitic Fluid, Bile, Synovial Fluid.*

Amongst urine specimens, *E. coli* (50.6%) was the most commonly isolated pathogen. From blood specimens the most common isolated priority pathogen was *Klebsiella* spp. (18.6%), followed by *Staph. aureus* (14.2%) and *Salmonella* Typhi and Paratyphi (13.5%). Among isolates from pus and wound swabs, *Pseudomonas* spp. (34.4%) was the most frequent, followed by *Klebsiella* spp. (29.9%) and *Staph. aureus* (16.1%). *Klebsiella* spp. was the most frequent pathogen isolated from respiratory samples (74.9%), including sputum (91.6%), and from body fluids (39.3%).

Among non-lactose-fermenting Gram-negative bacilli, *Pseudomonas* spp. was most commonly isolated from pus and wound swabs (34.4%) and *Acinetobacter* spp. from body fluids (12.5%) and respiratory samples (11.1%). Amongst Gram-positive organisms, *Enterococcus* spp. was isolated almost exclusively from urine (10.8%) and *Staph. aureus* most often from pus and wound swabs (16.1%). (Table 3)

## Sample: Blood
## July 25 - June 26

# Antimicrobial resistance patterns of bacterial isolates in blood

**Organisms isolated (automated and conventional blood culture):**

| Organism | Automated | Conventional | Total | % |
|---|---|---|---|---|
| *Klebsiella* spp. | 190 | 62 | **252** | 18.6% |
| SOSA (Staphylococcus other than S. aureus) | 246 | - | **246** | 18.1% |
| *Staphylococcus aureus* | 89 | 104 | **193** | 14.2% |
| *Salmonella Typhi* | 48 | 94 | **142** | 10.5% |
| *Acinetobacter* spp. | 83 | 44 | **127** | 9.4% |
| *Pseudomonas* spp. | 51 | 48 | **99** | 7.3% |
| *Burkholderia* spp. | 72 | - | **72** | 5.3% |
| *E. coli* | 45 | 15 | **60** | 4.4% |
| *Salmonella* spp. (other than S. Typhi) | 26 | - | **26** | 1.9% |
| *Enterobacter* spp. | 18 | - | **18** | 1.3% |
| *Salmonella Paratyphi A* | - | 15 | **15** | 1.1% |
| *Stenotrophomonas maltophilia* | 12 | - | **12** | 0.9% |
| *Serratia* spp. | 10 | - | **10** | 0.7% |
| *Proteus* spp. | 2 | 6 | **8** | 0.6% |
| *Enterococcus* spp. | 6 | - | **6** | 0.4% |
| Others | 71 | - | **71** | 5.2% |
| **Total culture positive** | **969** | **388** | **1357** | **100%** |
| Total number of samples | 6,661 | 10,243 | **16,904** | |
| Rate of isolation of bacteria | 14.55% | 3.79% | **8.03%** | |

*SOSA: Staphylococcus other than S. aureus. Others (automated system): Achromobacter denitrificans, Neisseria animaloris, Cryptococcus laurentii, Aerococcus viridans, Achromobacter xylosoxidans, Streptococcus sanguinis, Providencia rettgeri, Pandoraea sp., Sphingomonas paucimobilis, Aeromonas veronii.*

# Antimicrobial resistance patterns of bacterial isolates in Automated Blood Culture

(samples: 6,661; culture positive: 969; isolation rate: 14.55%)

| Antimicrobials | *Salmonella Typhi* (n=48) | *Klebsiella* spp. (n=190) | SOSA (n=246) | *Acinetobacter* spp. (n=83) | *S. aureus* (n=89) | *Pseudomonas* spp. (n=51) | *Burkholderia* spp. (n=72) | *E. coli* (n=45) | S. maltophilia (n=12) | *Salmonella* spp. (non-Typhi) (n=26) | *Enterobacter* spp. (n=18) | *Enterococcus* spp. (n=6) | *Proteus* spp. (n=2) | *Serratia* spp. (n=10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ampicillin** | 1 (2.08%) | 18 (9.47%) | 97 (39.43%) | | | | | 8 (17.78%) | 2 (16.67%) | 1 (3.85%) | | 0 (0.00%) | | |
| **Cloxacillin** | | | 77 (31.30%) | | 45 (50.56%) | | | | | | | | | |
| **Erythromycin** | | | 195 (79.27%) | | 69 (77.53%) | | | | | | | 0 (0.00%) | | |
| **Ampicillin-sulbactam** | | 61 (32.11%) | | 7 (8.43%) | | | 4 (5.56%) | 12 (26.67%) | | | 2 (11.11%) | | | 3 (30.00%) |
| **Cotrimoxazole** | 2 (4.17%) | 123 (64.74%) | 77 (31.30%) | 44 (53.01%) | 35 (39.33%) | 4 (7.84%) | 34 (47.22%) | 29 (64.44%) | 1 (8.33%) | 1 (3.85%) | 13 (72.22%) | | 2 (100.00%) | 2 (20.00%) |
| **Ciprofloxacin** | 9 (18.75%) | 150 (78.95%) | 69 (28.05%) | 52 (62.65%) | 31 (34.83%) | 26 (50.98%) | 36 (50.00%) | 33 (73.33%) | 8 (66.67%) | 9 (34.62%) | 9 (50.00%) | 2 (33.33%) | 2 (100.00%) | 2 (20.00%) |
| **Benzylpenicillin** | | | 120 (48.78%) | | 42 (47.19%) | | | 0 (0.00%) | | | | 2 (33.33%) | | |
| **Nalidixic acid** | 10 (20.83%) | | 9 (3.66%) | | | | | | | 6 (23.08%) | | | | |
| **Clindamycin** | 2 (4.17%) | | 106 (43.09%) | | 39 (43.82%) | | | | | | | | | |
| **Ceftriaxone** | 3 (6.25%) | 134 (70.53%) | 2 (0.81%) | 55 (66.27%) | 1 (1.12%) | 1 (1.96%) | 8 (11.11%) | 33 (73.33%) | 6 (50.00%) | 1 (3.85%) | 14 (77.78%) | | 2 (100.00%) | 5 (50.00%) |
| **Gentamicin** | | 113 (59.47%) | | 60 (72.29%) | 1 (1.12%) | 11 (21.57%) | 34 (47.22%) | 23 (51.11%) | 7 (58.33%) | | 11 (61.11%) | 4 (66.67%) | 2 (100.00%) | 2 (20.00%) |
| **Levofloxacin** | | | 39 (15.85%) | | 5 (5.62%) | | | | | | | 0 (0.00%) | | |
| **Amoxicillin-clavulanate** | 0 (0.00%) | 74 (38.95%) | | | | | | 9 (20.00%) | | 0 (0.00%) | | | | 1 (10.00%) |
| **Cefoperazone-sulbactam** | | 56 (29.47%) | | 11 (13.25%) | | 3 (5.88%) | 9 (12.50%) | 5 (11.11%) | | | 4 (22.22%) | | | 1 (10.00%) |
| **Ceftazidime** | | 12 (6.32%) | | 13 (15.66%) | | 11 (21.57%) | 12 (16.67%) | 2 (4.44%) | 6 (50.00%) | | | | 1 (50.00%) | |
| **Cefuroxime** | | 97 (51.05%) | 4 (1.63%) | | | 1 (1.96%) | 1 (1.39%) | 22 (48.89%) | | | | | 1 (50.00%) | |
| **Amikacin** | | 59 (31.05%) | | 50 (60.24%) | | 7 (13.73%) | 24 (33.33%) | 7 (15.56%) | 7 (58.33%) | | 6 (33.33%) | | | 2 (20.00%) |
| **Aztreonam** | | 8 (4.21%) | | | | 1 (1.96%) | 2 (2.78%) | 1 (2.22%) | | | | | 1 (50.00%) | |
| **Azithromycin** | 2 (4.17%) | | | | | | | | | 1 (3.85%) | | | | |
| **Meropenem** | | 139 (73.16%) | | 60 (72.29%) | | 24 (47.06%) | 34 (47.22%) | 20 (44.44%) | 8 (66.67%) | | 13 (72.22%) | | | 4 (40.00%) |
| **Netilmicin** | | 13 (6.84%) | | | | 1 (1.96%) | 3 (4.17%) | 2 (4.44%) | 2 (16.67%) | | | | | |
| **Tetracycline** | | | 52 (21.14%) | | 7 (7.87%) | | | 1 (2.22%) | 1 (8.33%) | | | 0 (0.00%) | | |
| **Cefixime** | 2 (4.17%) | 18 (9.47%) | | 2 (2.41%) | | 4 (7.84%) | 1 (1.39%) | | 1 (8.33%) | 0 (0.00%) | | | | |
| **Cefepime** | 3 (6.25%) | 138 (72.63%) | | 43 (51.81%) | | 22 (43.14%) | 21 (29.17%) | 35 (77.78%) | 7 (58.33%) | 1 (3.85%) | 9 (50.00%) | | 1 (50.00%) | 3 (30.00%) |
| **Piperacillin-tazobactam** | | 134 (70.53%) | | 44 (53.01%) | | 24 (47.06%) | 23 (31.94%) | 20 (44.44%) | 6 (50.00%) | | 12 (66.67%) | | 1 (50.00%) | 1 (10.00%) |
| **Daptomycin** | | | 0 (0.00%) | | 0 (0.00%) | | | | 2 (16.67%) | | | | | |
| **Colistin** | | 9 (4.74%) | | 4 (4.82%) | | 0 (0.00%) | | 0 (0.00%) | | | 0 (0.00%) | | | |
| **Tigecycline** | | 5 (2.63%) | 0 (0.00%) | 1 (1.20%) | 0 (0.00%) | | | 0 (0.00%) | | | | | | 2 (20.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

## Antimicrobial resistance patterns of bacterial isolates in Conventional Blood Culture

(samples: 10,243; culture positive: 388; isolation rate: 3.79%)

| Antimicrobials | *Salmonella Typhi* (n=94) | *S. aureus* (n=104) | *Salmonella Paratyphi A* (n=15) | *Acinetobacter* spp. (n=44) | *Klebsiella* spp. (n=62) | *Pseudomonas* spp. (n=48) | *E. coli* (n=15) | *Proteus* spp. (n=6) |
|---|---|---|---|---|---|---|---|---|
| **Amoxicillin** | 11 (11.70%) | 52 (50%) | 0 (0.00%) | 1 (2.27%) | 55 (88.70%) | | 9 (60%) | 5 (83.33%) |
| **Cloxacillin** | | 50 (48.07%) | | | | | | |
| **Erythromycin** | | 75 (72.11%) | | | | | | |
| **Cotrimoxazole** | 15 (15.95%) | 43 (41.34%) | 0 (0.00%) | 21 (47.72%) | 48 (77.41%) | 38 (79.16%) | 9 (60%) | 5 (83.33%) |
| **Ciprofloxacin** | 62 (65.95%) | 53 (50.96%) | 14 (93.33%) | 31 (70.45%) | 50 (80.64%) | 28 (58.33%) | 8 (53.33%) | 5 (83.33%) |
| **Nalidixic acid** | 89 (94.68%) | | 15 (100%) | | | | | |
| **Ceftriaxone** | 2 (2.12%) | | 0 (0.00%) | 27 (61.36%) | 49 (79.03%) | 1 (2.08%) | 8 (53.33%) | 4 (66.66%) |
| **Gentamicin** | | 1 (0.96%) | | 33 (75%) | 51 (82.25%) | 35 (72.91%) | 7 (46.66%) | 5 (83.33%) |
| **Chloramphenicol** | 14 (14.89%) | | 0 (0.00%) | | | | | |
| **Amoxicillin-clavulanate** | | | | 5 (11.36%) | | | 1 (6.66%) | 2 (33.33%) |
| **Cefotaxime** | | | | 27 (61.36%) | | | 1 (6.66%) | 2 (33.33%) |
| **Ceftazidime** | | | | 25 (56.81%) | 48 (77.41%) | 26 (54.16%) | 7 (46.66%) | 2 (33.33%) |
| **Cefuroxime** | | | | | | | | 2 (33.33%) |
| **Amikacin** | | | | 26 (59.09%) | 50 (80.64%) | 32 (66.66%) | 6 (40%) | 4 (66.66%) |
| **Aztreonam** | | | | | 44 (70.96%) | 2 (4.16%) | 7 (46.66%) | 2 (33.33%) |
| **Azithromycin** | | | 15 (100%) | | 5 (8.06%) | 15 (31.25%) | 1 (6.66%) | 2 (33.33%) |
| **Meropenem** | | | | 19 (43.18%) | 2 (3.22%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Netilmicin** | | | | | 34 (54.83%) | 1 (2.08%) | 5 (33.33%) | 2 (33.33%) |
| **Cefixime** | 4 (4.25%) | | 0 (0.00%) | 1 (2.27%) | 48 (77.41%) | 1 (2.08%) | 7 (46.66%) | 1 (16.66%) |
| **Cefepime** | 1 (1.06%) | | 0 (0.00%) | 1 (2.27%) | 40 (64.51%) | 28 (58.33%) | 7 (46.66%) | 1 (16.66%) |
| **Piperacillin-tazobactam** | | | | 21 (47.72%) | 42 (67.74%) | 17 (35.41%) | 5 (33.33%) | 3 (50%) |
| **Colistin** | | | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | |
| **Tigecycline** | | | | 0 (0.00%) | 4 (4.83%) | | 0 (0.00%) | 0 (0.00%) |
| **Cefoxitin** | | 29 (27.88%) | | | | | | |
| **Vancomycin** | | 0 (0.00%) | | | | | | |
| **Linezolid** | | 0 (0.00%) | | | | | | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in blood samples

During 2025-26, blood cultures were processed by an automated system (6,661 samples; 14.6% positive) and by conventional culture (10,243 samples; 3.8% positive). Altogether 1,357 of 16,904 blood cultures (8%) yielded bacterial growth. *Klebsiella* spp. was the commonest isolate (252; 18.6%), followed by Staphylococci other than *S. aureus* (SOSA, 246; 18.1%, all from the automated system), *S. aureus* (193; 14.2%), *Salmonella* Typhi (142; 10.5%) and *Acinetobacter* spp. (127; 9.4%). *Salmonella enterica* as a whole (Typhi, Paratyphi A and other serovars) accounted for 183 isolates (13.5%). Resistance percentages quoted below pool the automated and conventional results unless stated otherwise.

The data analysis of 142 *Salmonella enterica* serovar Typhi isolates revealed ciprofloxacin resistance of 50%, an increase from 40.3% in 2024-25, and nalidixic acid resistance of 69.7%. Resistance to other first-line antibiotics remained relatively low: cotrimoxazole 12%, chloramphenicol 14.9% (conventional isolates) and amoxicillin 11.7%. Ceftriaxone resistance was detected in 5 isolates (3.5%) and cefixime resistance in 6 isolates (4.2%); azithromycin resistance was found in 2 of the 48 isolates tested in the automated system (4.2%). All 15 *S.* Paratyphi A isolates from conventional culture were resistant to nalidixic acid and 93.3% to ciprofloxacin, while none was resistant to ceftriaxone, cefixime, cotrimoxazole or chloramphenicol. Azithromycin resistance was reported in all Paratyphi A isolates; as CLSI azithromycin breakpoints are defined for *S.* Typhi only, this result should be interpreted with caution.

Among 104 *S. aureus* isolates from conventional blood culture, 29 (27.9%) were resistant to cefoxitin, a surrogate marker for *mecA*-mediated oxacillin resistance (20.9% in 2024-25). In the automated system, 50.6% of 89 *S. aureus* isolates were oxacillin (cloxacillin) resistant, with high resistance to erythromycin (77.5%) and clindamycin (43.8%). No vancomycin, linezolid, daptomycin or tigecycline resistance was detected among blood isolates of *S. aureus*. SOSA (246 isolates) showed high resistance to erythromycin (79.3%) and benzylpenicillin (48.8%) and 31.3% were oxacillin resistant; the clinical significance of SOSA should always be interpreted together with the number of positive bottles and the clinical picture.

*Klebsiella* spp. (252 isolates) showed high resistance to ciprofloxacin (79.4%), ceftriaxone (72.6%), cefepime (70.6%), piperacillin-tazobactam (69.8%) and gentamicin (65.1%). Meropenem resistance was 56% overall, with a striking difference between automated (73.2%) and conventional (3.2%) isolates. Colistin resistance was confirmed by broth microdilution in 9 isolates (4.7% of automated isolates) and tigecycline resistance in 9 (3.6%).

Blood isolates of *Acinetobacter* spp. (127) showed more than 50% resistance to most tested antibiotics, including gentamicin (73.2%), ciprofloxacin (65.4%), ceftriaxone (64.6%), meropenem (62.2%) and amikacin (59.8%); colistin resistance was found in 4 isolates (3.1%). *E. coli* (60) showed resistance to ciprofloxacin and ceftriaxone of 68.3% each, gentamicin 50% and meropenem 33.3% (22.5% in 2024-25), while all isolates remained susceptible to colistin and tigecycline. *Pseudomonas* spp. (99) exhibited resistance to ciprofloxacin (54.5%), cefepime (50.5%), gentamicin (46.5%), piperacillin-tazobactam (41.4%) and meropenem (24.2%), with no colistin resistance.

*Burkholderia* spp. (72 isolates) showed resistance to cotrimoxazole (47.2%), meropenem (47.2%) and ceftazidime (16.7%), while only 8.3% of 12 *Stenotrophomonas maltophilia* isolates were cotrimoxazole resistant. *Enterobacter* spp. (18) showed 72.2% meropenem resistance.

Overall, these findings highlight high and rising resistance to critical antibiotics, particularly carbapenem resistance in *Klebsiella* spp. and *Acinetobacter* spp. and the renewed increase of fluoroquinolone resistance in *S.* Typhi. Continued surveillance and judicious use of antibiotics remain essential to managing these growing threats.

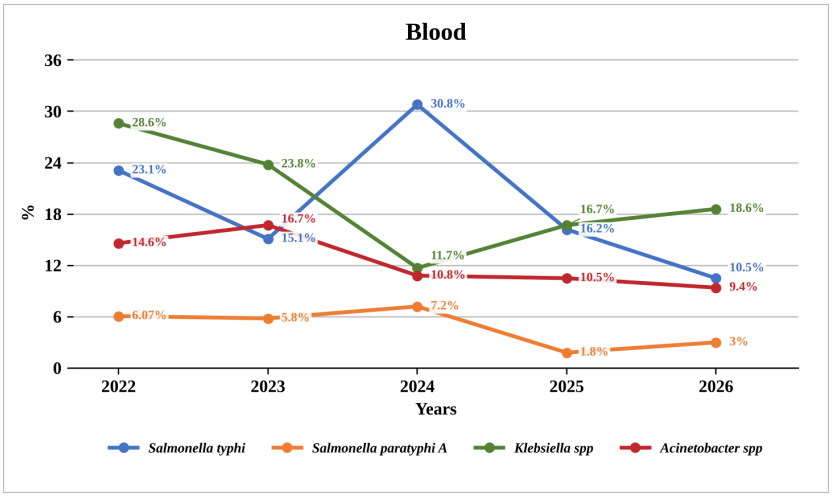



*Figure 1: Trends of pathogens isolated from blood samples from 2022 to 2026*

The trend analysis shows that *Klebsiella* spp. has become the most prevalent blood isolate, rising from 16.7% in 2025 to 18.6% in 2026. *Salmonella enterica* typhi declined further from 16.2% to 10.5%, while *Salmonella* paratyphi A and other non-Typhi *Salmonella* accounted for 3% (1.8% in 2025). *Acinetobacter* spp. remained stable (9.4% vs. 10.5%). This shift underscores the changing landscape of bloodstream pathogens, with growing concern about multidrug-resistant *Klebsiella* spp. Part of the change may reflect the introduction of the automated blood-culture system, which also recovers more Gram-positive cocci.

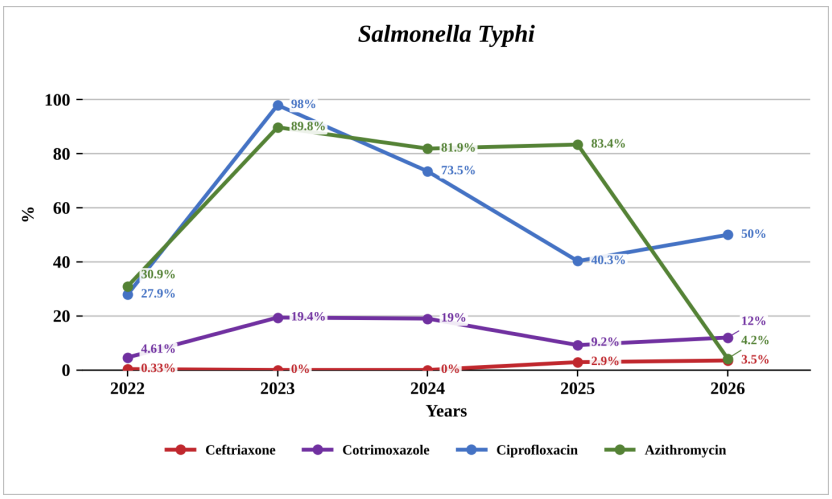



*Figure 2: Trends of resistance pattern of Salmonella enterica Typhi isolated from blood samples*

Ciprofloxacin resistance in *S.* Typhi, which had declined from 98% in 2023 to 40.3% in 2025, increased again to 50% in 2026. Cotrimoxazole resistance rose slightly from 9.2% to 12%. Ceftriaxone resistance continues its gradual increase, from 2.9% to 3.5%; although still low, this emerging resistance signals a concerning development and warrants sequencing of resistant isolates to investigate clonality. The azithromycin estimate for 2026 (4.2%) is based only on the 48 isolates tested in the automated system and is therefore not directly comparable with earlier years.

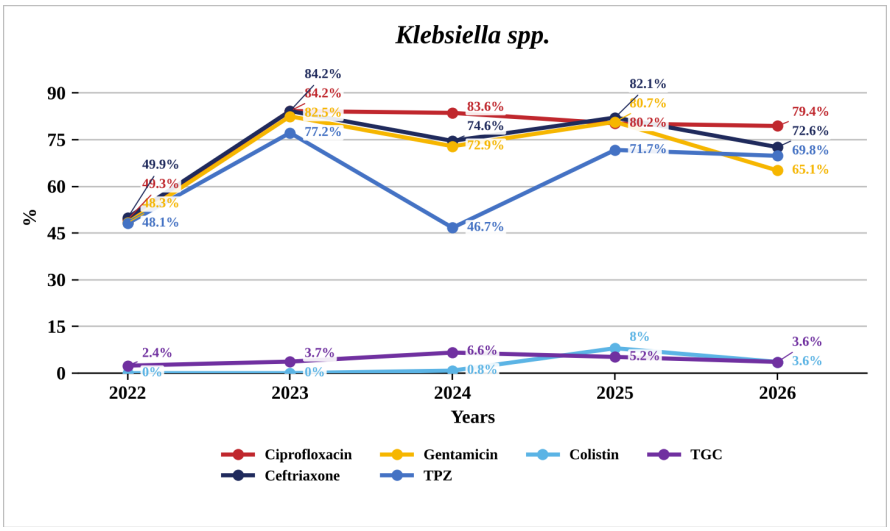



*Figure 3: Trends of resistance pattern of Klebsiella spp. isolated from blood samples*

For *Klebsiella* spp. in blood, resistance remains high but showed some decrease in 2026: ceftriaxone fell from 82.1% to 72.6%, gentamicin from 80.7% to 65.1% and piperacillin-tazobactam from 71.7% to 69.8%, while ciprofloxacin resistance remained around 80% (79.4%). Colistin resistance declined from 8% to 3.6% and tigecycline resistance from 5.2% to 3.6%; these last-resort agents nevertheless require continued monitoring given the high meropenem resistance (56%).

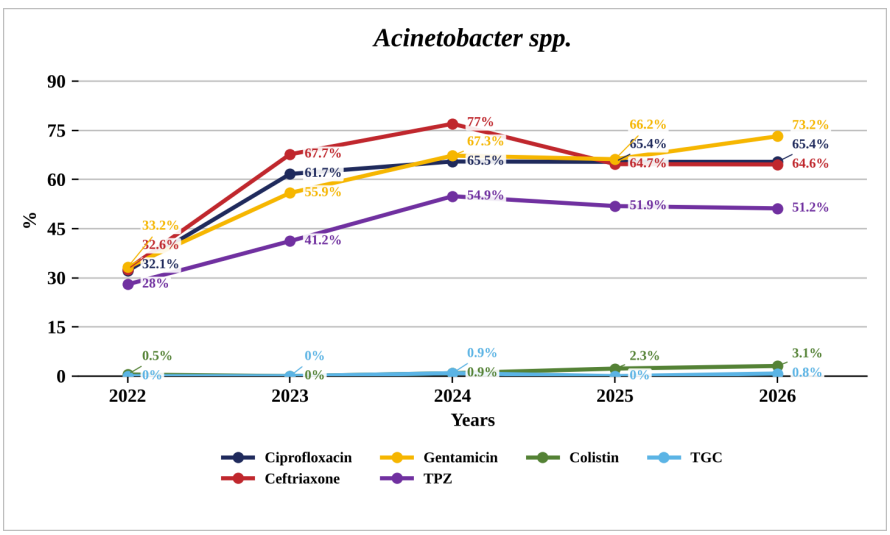



*Figure 4: Trends of resistance pattern of Acinetobacter spp. isolated from blood samples*

*Acinetobacter* spp. resistance to ciprofloxacin (65.4%), ceftriaxone (64.6%) and piperacillin-tazobactam (51.2%) remained at the 2025 level, whereas gentamicin resistance increased from 66.2% to 73.2%. Colistin resistance rose gradually from 2.3% to 3.1% and tigecycline resistance appeared (0.8%), which is particularly concerning given their role as last-resort treatment options.

# Sample: Urine
## July 25 - June 26

| | |
|---|---|
| Total number of samples | 17,138 |
| Total culture positive | 6,445 |
| Rate of isolation of bacteria | 37.61% |
| ESBL isolates | 176 |
| MRSA | 32 |
| VRSA | 12 |
| VRE | 13 |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 1182 | 18.34% |
| *E. coli* | 3260 | 50.58% |
| *Staphylococcus aureus* | 522 | 8.10% |
| *Serratia* spp. | 164 | 2.55% |
| *Pseudomonas* spp. | 327 | 5.07% |
| *Acinetobacter* spp. | 141 | 2.19% |
| *Enterobacter* spp. | 21 | 0.32% |
| *Proteus* spp. | 108 | 1.68% |
| *Enterococcus* spp. | 696 | 10.80% |
| *Streptococcus agalactiae* | 22 | 0.34% |
| *Salmonella Typhi* | 2 | 0.03% |

# Antimicrobial resistance patterns of bacterial isolates in Urine

| Antimicrobials | *Klebsiella* spp. (n=1182) | *E. coli* (n=3260) | *S. aureus* (n=522) | *Serratia* spp. (n=164) | *Pseudomonas* spp. (n=327) | *Acinetobacter* spp. (n=141) | *Enterobacter* spp. (n=21) | *Proteus* spp. (n=108) | *Enterococcus* spp. (n=696) | *Streptococcus agalactiae* (n=22) | *Salmonella Typhi* (n=2) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Amoxicillin** | 1029 (87.05%) | 2700 (82.82%) | 322 (61.68%) | 71 (43.29%) | | | 18 (85.71%) | 72 (66.67%) | 384 (55.17%) | 4 (18.18%) | 0 (0.00%) |
| **Cloxacillin** | | | 329 (63.03%) | | | | | | | | |
| **Erythromycin** | | | 0 (0.00%) | | | | | | | 13 (59.09%) | |
| **Cotrimoxazole** | 792 (67.00%) | 2089 (64.08%) | 290 (55.56%) | 89 (6.52%) | | 56 (39.72%) | 14 (66.67%) | 62 (57.41%) | 352 (50.57%) | 12 (54.54%) | 0 (0.00%) |
| **Ciprofloxacin** | 671 (56.77%) | 2460 (75.46%) | 382 (73.18%) | 152 (92.68%) | 242 (74.01%) | 94 (66.67%) | 13 (61.90%) | 66 (61.11%) | 548 (78.73%) | | 2 (100.00%) |
| **Nitrofurantoin** | 952 (80.54%) | 1634 (50.12%) | 221 (42.34%) | 73 (44.51%) | | | 15 (71.43%) | 70 (64.81%) | 326 (46.84%) | 0 (0.00%) | 1 (50.00%) |
| **Nalidixic acid** | 783 (66.24%) | 2409 (73.89%) | | 0 (0.00%) | | | 13 (61.90%) | 63 (58.33%) | | | 2 (100.00%) |
| **Mecillinam** | 758 (64.13%) | 1853 (56.84%) | | 1 (0.61%) | | | 15 (71.43%) | 26 (24.07%) | | | 0 (0.00%) |
| **Ceftriaxone** | 661 (55.92%) | 2028 (62.20%) | | 0 (0.00%) | | 84 (59.57%) | 13 (61.90%) | 45 (41.67%) | | | 0 (0.00%) |
| **Gentamicin** | 720 (60.91%) | 1726 (52.94%) | 220 (42.14%) | 135 (82.32%) | 220 (67.28%) | 88 (62.41%) | 12 (57.14%) | 60 (55.56%) | 474 (68.10%) | | 0 (0.00%) |
| **Cefotaxime** | 598 (50.59%) | 2026 (62.15%) | | 0 (0.00%) | | 97 (68.79%) | 15 (71.43%) | 38 (35.18%) | | | 0 (0.00%) |
| **Ceftazidime** | 611 (51.69%) | 1925 (59.05%) | | 0 (0.00%) | 195 (59.63%) | | 13 (61.90%) | 19 (17.59%) | | | 0 (0.00%) |
| **Cefuroxime** | 703 (59.47%) | 2035 (62.42%) | 166 (31.80%) | 1 (0.61%) | | 90 (63.83%) | 15 (71.43%) | 51 (47.22%) | | | 0 (0.00%) |
| **Amikacin** | 641 (54.23%) | 1488 (45.64%) | 169 (32.37%) | 0 (0.00%) | 190 (58.10%) | 77 (54.61%) | 11 (52.38%) | 18 (16.67%) | | | 0 (0.00%) |
| **Aztreonam** | 550 (46.53%) | 1783 (54.69%) | | 0 (0.00%) | 183 (55.96%) | | 10 (47.62%) | 17 (15.74%) | | | 0 (0.00%) |
| **Meropenem** | 292 (24.70%) | 601 (18.43%) | | 0 (0.00%) | 154 (47.09%) | 45 (31.91%) | 6 (28.57%) | 20 (18.52%) | | | 0 (0.00%) |
| **Netilmicin** | 284 (24.03%) | 621 (19.05%) | 20 (3.83%) | 0 (0.00%) | 161 (49.23%) | 57 (40.42%) | 3 (14.28%) | 20 (18.52%) | | | 0 (0.00%) |

| Antimicrobials | *Klebsiella* spp. (n=1182) | *E. coli* (n=3260) | *S. aureus* (n=522) | *Serratia* spp. (n=164) | *Pseudomonas* spp. (n=327) | *Acinetobacter* spp. (n=141) | *Enterobacter* spp. (n=21) | *Proteus* spp. (n=108) | *Enterococcus* spp. (n=696) | *Streptococcus agalactiae* (n=22) | *Salmonella Typhi* (n=2) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cefixime** | 243 (20.56%) | 400 (12.27%) | | 0 (0.00%) | | | 4 (19.05%) | 1 (0.92%) | | | 0 (0.00%) |
| **Cefepime** | 324 (27.41%) | 635 (19.48%) | | 0 (0.00%) | | | 4 (19.05%) | 1 (0.92%) | | | 0 (0.00%) |
| **Piperacillin-tazobactam** | 173 (14.64%) | 308 (9.45%) | | 0 (0.00%) | 98 (29.97%) | 50 (35.46%) | 2 (9.52%) | 7 (6.48%) | | | |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | | | | |
| **Polymyxin B** | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | 0 (0.00%) | | | |
| **Tigecycline** | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | | | 0 (0.00%) | 0 (0.00%) | | | |
| **Cefoxitin** | | | 96 (18.39%) | | | | | | | | |
| **Vancomycin** | | | 12 (2.30%) | | | | | | 13 (1.87%) | | |
| **Linezolid** | | | 13 (2.49%) | | | | | | 1 (0.14%) | | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in urine samples

A total of 17,138 urine samples were cultured, of which 6,445 (37.6%) were culture positive. *E. coli* was the predominant isolate (3,260; 50.6%), followed by *Klebsiella* spp. (1,182; 18.3%), *Enterococcus* spp. (696; 10.8%), *S. aureus* (522; 8.1%) and *Pseudomonas* spp. (327; 5.1%). ESBL production was detected in 176 isolates (2.7%).

For *E. coli*, there is significant resistance to amoxicillin (82.8%), ciprofloxacin (75.5%), nalidixic acid (73.9%), cotrimoxazole (64.1%) and ceftriaxone (62.2%), which are typically used as first-line oral or empirical options. Resistance to mecillinam (56.8%) and nitrofurantoin (50.1%) has increased, and amikacin resistance reached 45.6%. Meropenem (18.4%) and piperacillin-tazobactam (9.4%) retain relatively lower resistance, while colistin, polymyxin B and tigecycline remain fully active against *E. coli*.

*Klebsiella* spp. shows a similar trend with resistance to nitrofurantoin (80.5%), cotrimoxazole (67%), gentamicin (60.9%), ciprofloxacin (56.8%) and ceftriaxone (55.9%). Meropenem resistance was 24.7% and piperacillin-tazobactam 14.6%; colistin, polymyxin B and tigecycline remain effective options.

For *S. aureus*, resistance to ciprofloxacin (73.2%) and cloxacillin (63%) is high and cefoxitin resistance (MRSA) was 18.4%. Of particular concern, vancomycin resistance was reported in 12 isolates (2.3%) and linezolid resistance in 13 (2.5%). *Enterococcus* spp. showed resistance to ciprofloxacin (78.7%), gentamicin (68.1%) and nitrofurantoin (46.8%), with vancomycin resistance in 13 isolates (1.9%) and linezolid resistance in one. Vancomycin resistance in *S. aureus* cannot be reliably detected by disk diffusion; all such isolates should be confirmed by broth microdilution MIC and *vanA/vanB* testing and referred to the national reference laboratory before being reported as VRSA or VRE.

In *Pseudomonas* spp., resistance to ciprofloxacin (74%), gentamicin (67.3%) and ceftazidime (59.6%) is prominent, and meropenem resistance rose to 47.1%. *Acinetobacter* spp., often associated with hospital-acquired infections, shows high resistance to ciprofloxacin (66.7%), gentamicin (62.4%) and ceftriaxone (59.6%), with meropenem resistance of 31.9%. Colistin resistance was not detected in either organism.

The overall picture points to increasing resistance across multiple classes of antibiotics, especially fluoroquinolones, cephalosporins and nitrofurantoin. Piperacillin-tazobactam, meropenem and, for *E. coli*, amikacin remain comparatively more effective, while colistin and tigecycline remain active reserve drugs.

# Trends of pathogens isolated from urine samples from 2022 to 2026

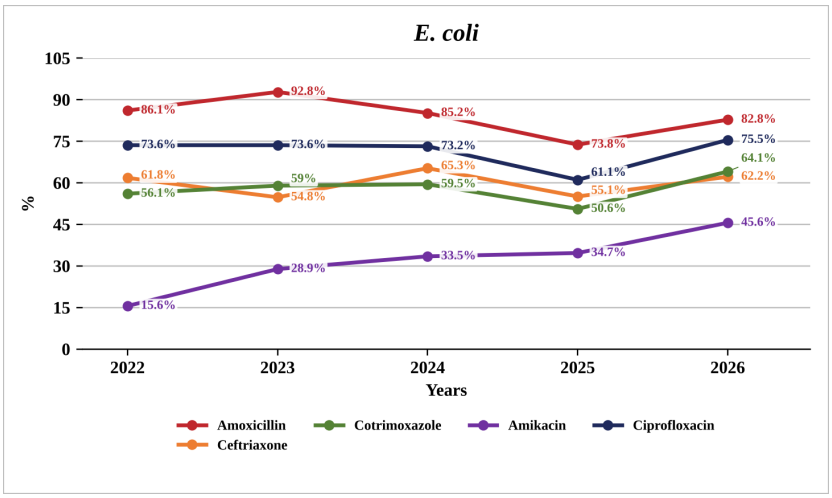



*Figure 5: Trends of resistance pattern of commonly used antibiotics in E. coli isolated from urine samples*

In 2026, *E. coli* resistance to the commonly used antibiotics increased after the decline seen in 2025. Amoxicillin resistance rose from 73.8% to 82.8%, ciprofloxacin from 61.1% to 75.5%, cotrimoxazole from 50.6% to 64.1% and ceftriaxone from 55.1% to 62.2%. Amikacin resistance has increased every year, from 15.6% in 2022 to 45.6% in 2026. These trends emphasize the need for ongoing surveillance and urine-culture-guided treatment.

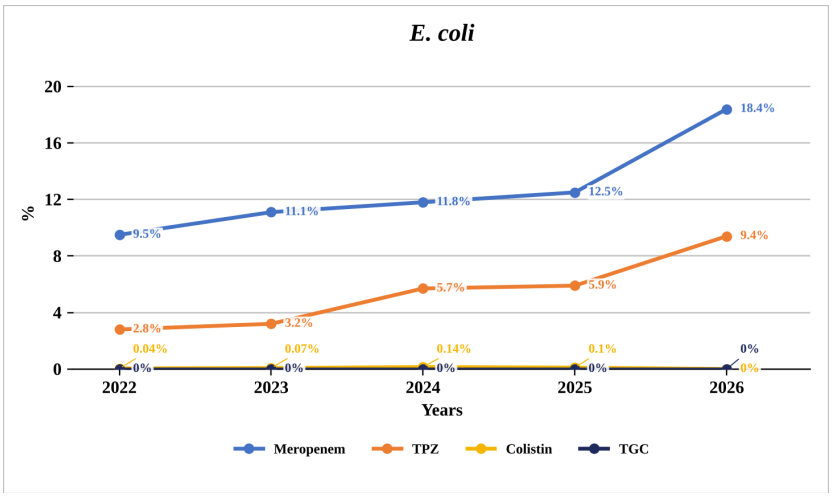



*Figure 6: Trends of resistance pattern of reserve antibiotics in E. coli isolated from urine samples*

The trend analysis of reserve antibiotics for *E. coli* reveals an emerging concern. Meropenem resistance has increased steadily from 9.5% in 2022 to 12.5% in 2025 and 18.4% in 2026, and piperacillin-tazobactam resistance from 2.8% in 2022 to 9.4% in 2026. In contrast, colistin and tigecycline resistance was not detected in 2026, underscoring their continued effectiveness, though continuous

monitoring is essential to ensure they retain their efficacy as reserve antibiotics.

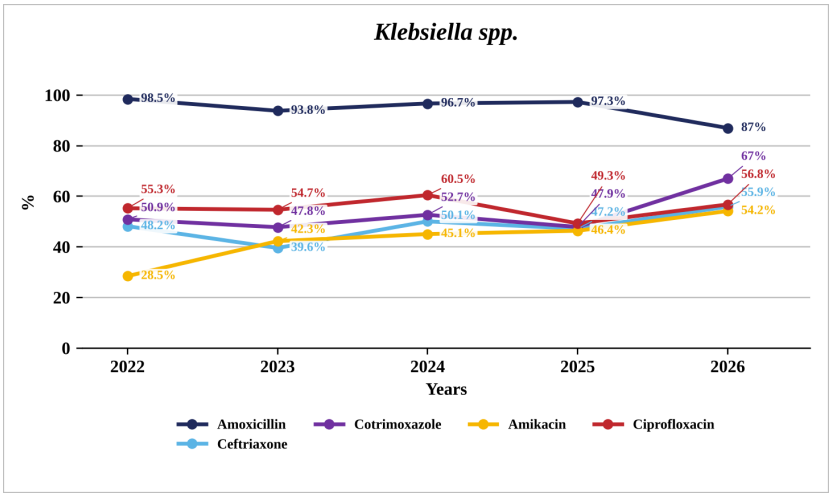



*Figure 7: Trends of resistance pattern of commonly used antibiotics in Klebsiella spp. isolated from urine samples*

For *Klebsiella* spp., resistance to ciprofloxacin (56.8%), ceftriaxone (55.9%), cotrimoxazole (67%) and amikacin (54.2%) all increased compared with 2025 (49.3%, 47.2%, 47.9% and 46.4% respectively), the cotrimoxazole and amikacin values being the highest of the five-year period. Resistance to amoxicillin, to which *Klebsiella* is intrinsically resistant, was 87%.

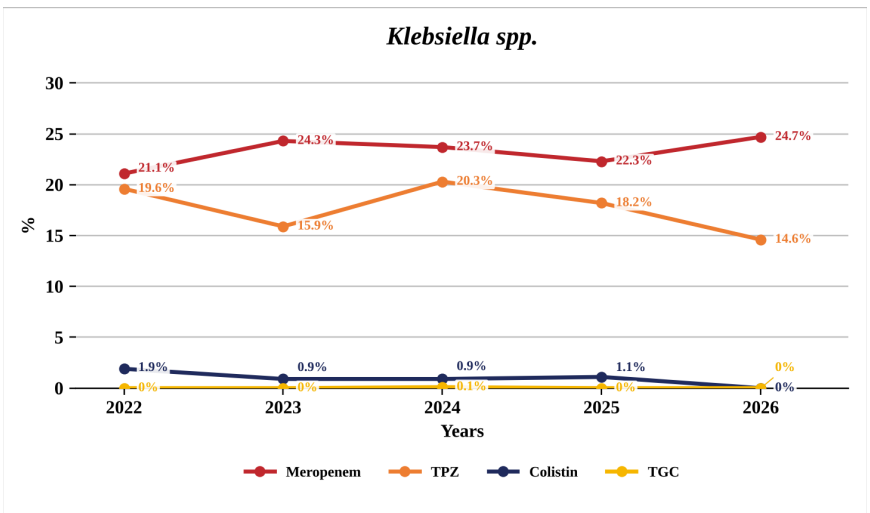



*Figure 8: Trends of resistance pattern of reserve antibiotics in Klebsiella spp. isolated from urine samples*

Meropenem resistance in urinary *Klebsiella* spp. increased from 22.3% in 2025 to 24.7% in 2026, the highest level in five years, whereas piperacillin-tazobactam resistance decreased from 18.2% to 14.6%. No colistin or tigecycline resistance was detected this year. This highlights the increasing challenge of carbapenem resistance in *Klebsiella* spp.

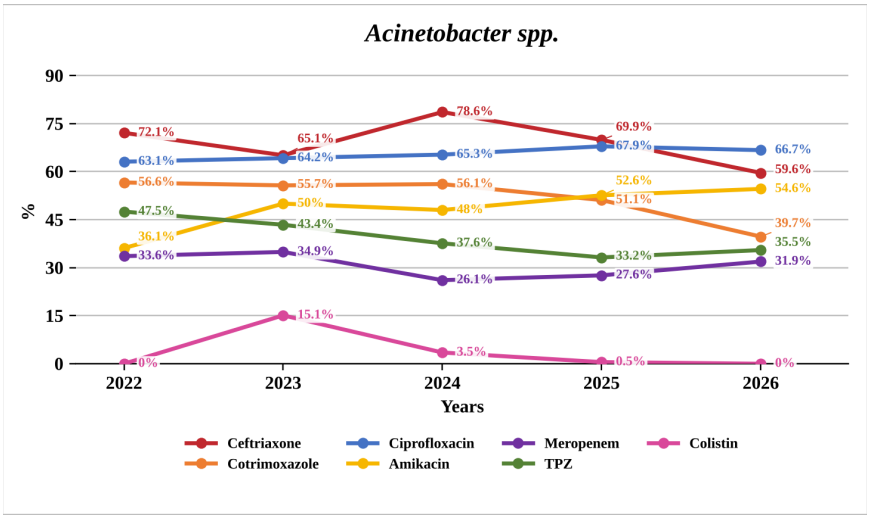



*Figure 9: Trends of resistance pattern of commonly used antibiotics in Acinetobacter spp. isolated from urine samples*

For *Acinetobacter* spp., resistance to ceftriaxone (59.6%) and cotrimoxazole (39.7%) decreased compared with 2025, while ciprofloxacin resistance remained high (66.7%). Resistance to amikacin (54.6%), meropenem (31.9%) and piperacillin-tazobactam (35.5%) increased slightly. No colistin resistance was detected, highlighting its continued effectiveness as a last-resort treatment.

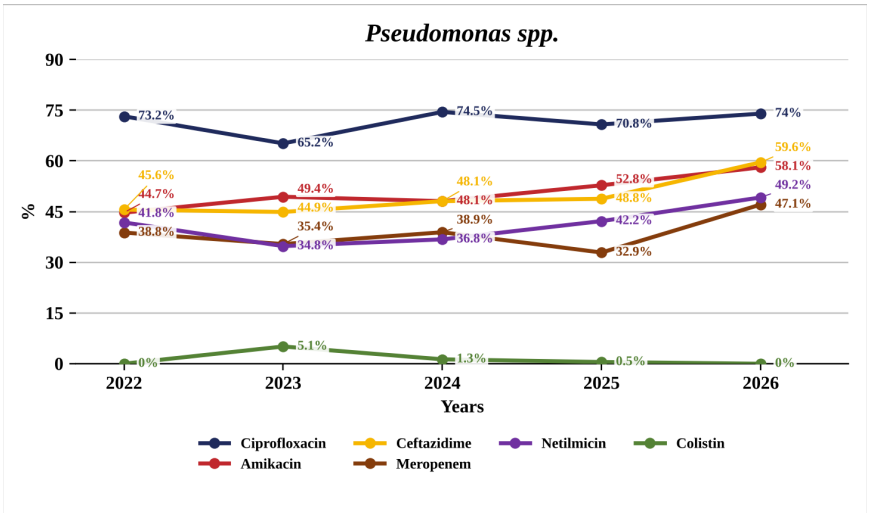



*Figure 10: Trends of resistance pattern of commonly used antibiotics in Pseudomonas spp. isolated from urine samples*

For *Pseudomonas* spp., ciprofloxacin resistance remained high (74%). Resistance to ceftazidime increased from 48.8% to 59.6%, amikacin from 52.8% to 58.1%, netilmicin from 42.2% to 49.2% and meropenem from 32.9% to 47.1%, while colistin resistance was not detected. These trends emphasize the growing resistance to key anti-pseudomonal agents.

# Sample: Sputum

## July 25 - June 26

| | |
|---|---|
| Total number of samples | **4,609** |
| Total culture positive | **1,280** |
| Rate of isolation of bacteria | **27.77%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 1173 | 91.64% |
| *Staphylococcus aureus* | 6 | 0.47% |
| *Pseudomonas* spp. | 31 | 2.42% |
| *Acinetobacter* spp. | 67 | 5.23% |
| *E. coli* | 1 | 0.08% |
| *Streptococcus pyogenes* | 0 | 0.00% |
| *Proteus* spp. | 2 | 0.16% |

# Antimicrobial resistance patterns of bacterial isolates in Sputum

| Antimicrobials | *Klebsiella* spp. (n=1173) | *S. aureus* (n=6) | *Pseudomonas* spp. (n=31) | *Acinetobacter* spp. (n=67) | *E. coli* (n=1) | *Streptococcus pyogenes* (n=0) | *Proteus* spp. (n=2) |
|---|---|---|---|---|---|---|---|
| **Amoxicillin** | 1077 (91.81%) | 5 (83.33%) | 3 (9.67%) | | 1 (100%) | 0 (0.00%) | 2 (50%) |
| **Cloxacillin** | | 2 (33.33%) | | | | | |
| **Erythromycin** | | 5 (100%) | | | | 0 (0.00%) | |
| **Cephradine** | | 6 (100%) | | | | | |
| **Cotrimoxazole** | 713 (60.78%) | 3 (50%) | 2 (6.45%) | 38 (56.71%) | 0 (0.00%) | 0 (0.00%) | 2 (100%) |
| **Ciprofloxacin** | 642 (54.73%) | | 23 (74.19%) | 36 (53.73%) | 0 (0.00%) | | 2 (100%) |
| **Ceftriaxone** | 660 (56.26%) | | 2 (6.45%) | 57 (85.07%) | 0 (0.00%) | | 2 (100%) |
| **Gentamicin** | 673 (52.57%) | 1 (16.66%) | 17 (54.83%) | 38 (56.71%) | | | 1 (50%) |
| **Amoxicillin-clavulanate** | 837 (71.35%) | | | | 1 (100%) | | 1 (100%) |
| **Cefotaxime** | 717 (61.12%) | | 2 (6.45%) | 61 (91.04%) | 0 (0.00%) | | 2 (100%) |
| **Ceftazidime** | 7 (0.59%) | | 18 (58.06%) | 52 (71.61%) | | | |
| **Cefuroxime** | 774 (65.98%) | | 3 (9.67%) | 58 (86.56%) | 0 (0.00%) | | 2 (100%) |
| **Amikacin** | 576 (49.10%) | | 13 (41.93%) | 37 (55.22%) | | | |
| **Aztreonam** | 2 (0.17%) | | 16 (51.61%) | | | | |
| **Azithromycin** | 1045 (89.08%) | | | 3 (4.47%) | 1 (100%) | | |
| **Meropenem** | 220 (18.75%) | | 12 (38.70%) | 21 (31.34%) | 0 (0.00%) | | 1 (100%) |
| **Netilmicin** | | | 10 (32.25%) | | | | |
| **Cefepime** | 0 (0.00%) | | 17 (54.83%) | | | | |
| **Piperacillin-tazobactam** | 224 (19.09%) | | 11 (35.48%) | 19 (28.35%) | 0 (0.00%) | | 1 (100%) |
| **Colistin** | 1 (0.08%) | | 1 (1.85%) | 1 (1.49%) | 0 (0.00%) | | |

*Values are number (%) of resistant isolates; blank = not tested.*




# Important findings in sputum samples

Among 4,609 sputum samples, 1,280 (27.8%) were culture positive. The most common pathogen was *Klebsiella spp.* (1,173; 91.6%; 87.8% in 2024-25), followed by *Acinetobacter spp.* (67; 5.2%) and *Pseudomonas spp.* (31; 2.4%).

*Klebsiella spp.* showed high resistance to azithromycin (89.1%), amoxicillin-clavulanate (71.3%), cefuroxime (66%), cotrimoxazole (60.8%), ceftriaxone (56.3%), ciprofloxacin (54.7%) and gentamicin (52.6%). Meropenem resistance increased from 14.2% to 18.8% and piperacillin-tazobactam resistance was 19.1%.

*Acinetobacter spp.* exhibits even higher resistance to cephalosporins: cefotaxime (91%), cefuroxime (86.6%) and ceftriaxone (85.1%), with meropenem resistance of 31.3%. *Pseudomonas spp.* shows high resistance to ciprofloxacin (74.2%), ceftazidime (58.1%) and gentamicin (54.8%), with meropenem resistance of 38.7%.

Colistin, considered a reserve drug, continues to show low resistance in *Klebsiella spp.* (0.1%), *Acinetobacter spp.* (1.5%) and *Pseudomonas spp.* (1.9%), as in the last few years.

# Sample: Wound Swab

## July 25 - June 26

| | |
|---|---|
| Total number of samples | **3,636** |
| Total culture positive | **2,132** |
| Rate of isolation of bacteria | **58.64%** |
| MRSA isolates | **68** |

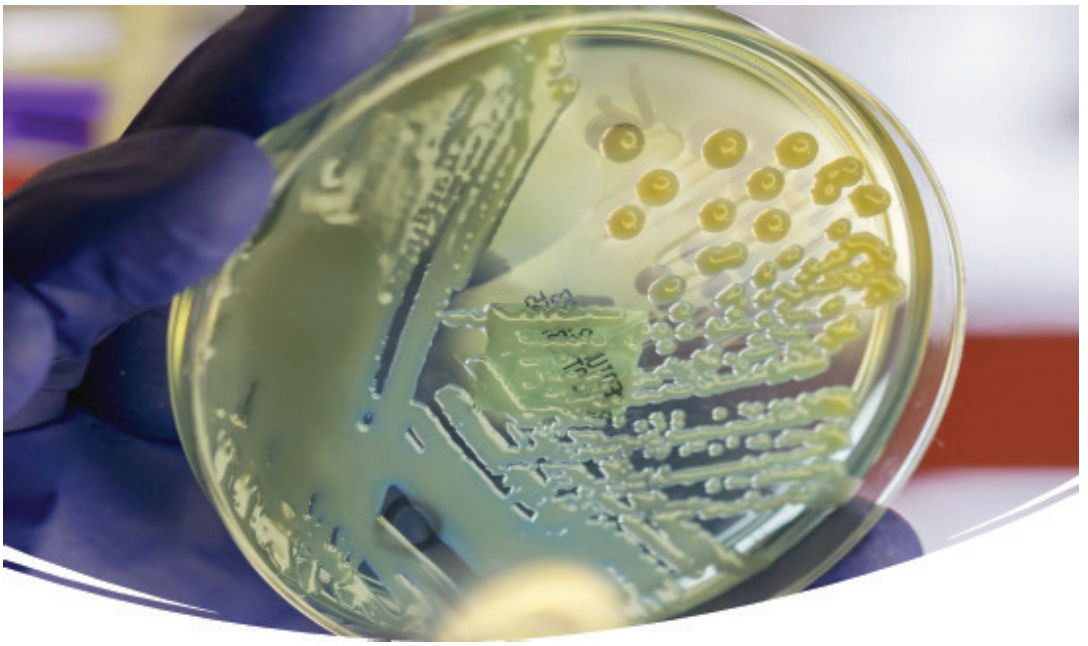
**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Pseudomonas* spp. | 872 | 40.90% |
| *Klebsiella* spp. | 625 | 29.32% |
| *Acinetobacter* spp. | 153 | 7.18% |
| *Staphylococcus aureus* | 266 | 12.48% |
| *E. coli* | 138 | 6.47% |
| *Proteus* spp. | 78 | 3.65% |

# Antimicrobial resistance patterns of bacterial isolates in Wound Swab

| Antimicrobials | *Klebsiella* spp. (n=625) | *S. aureus* (n=266) | *Pseudomonas* spp. (n=872) | *E. coli* (n=138) | *Acinetobacter* spp. (n=153) | *Proteus* spp. (n=78) |
|---|---|---|---|---|---|---|
| **Amoxicillin** | 518 (82.88%) | 229 (86.09%) | | 130 (94.20%) | | 57 (73.08%) |
| **Cloxacillin** | | 146 (54.89%) | | | | |
| **Erythromycin** | | 231 (86.84%) | | | | |
| **Cephradine** | | 190 (71.43%) | | | | |
| **Cotrimoxazole** | 491 (78.56%) | 124 (46.62%) | | 111 (80.43%) | 113 (73.86%) | 68 (87.18%) |
| **Ciprofloxacin** | 542 (86.72%) | 214 (80.45%) | 777 (89.10%) | 116 (84.06%) | 134 (87.58%) | 73 (93.59%) |
| **Ceftriaxone** | 548 (87.68%) | | | 116 (84.06%) | 141 (96.08%) | 63 (80.77%) |
| **Gentamicin** | 537 (85.92%) | 103 (38.72%) | 728 (83.49%) | 81 (58.69%) | 138 (90.20%) | 68 (87.18%) |
| **Amoxicillin-clavulanate** | 563 (90.08%) | | | 125 (90.57%) | | 60 (76.92%) |
| **Cefotaxime** | 554 (88.64%) | | | 117 (84.78%) | 145 (94.77%) | 63 (80.77%) |
| **Ceftazidime** | | | 751 (86.12%) | | 133 (86.93%) | |
| **Cefuroxime** | 569 (91.04%) | | | 121 (87.68%) | 151 (98.69%) | 69 (88.46%) |
| **Amikacin** | 394 (63.04%) | | 721 (82.68%) | 69 (50%) | | 66 (84.61%) |
| **Aztreonam** | | | 734 (84.17%) | | | |
| **Azithromycin** | 468 (74.88%) | | | 128 (92.75%) | | 58 (74.36%) |
| **Meropenem** | 409 (65.44%) | | 520 (59.63%) | 58 (42.03%) | 86 (56.21%) | 7 (8.97%) |
| **Netilmicin** | | | 330 (37.84%) | | | |
| **Cefepime** | | | 345 (39.56%) | | | |
| **Piperacillin-tazobactam** | 329 (52.64%) | | 662 (75.92%) | 52 (37.68%) | 63 (41.18%) | 10 (12.82%) |
| **Colistin** | 0 (0.00%) | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | |
| **Cefoxitin** | | 66 (24.82%) | | | | |
| **Vancomycin** | | 0 (0.00%) | | | | |
| **Linezolid** | | 1 (0.37%) | | | | |

*Values are number (%) of resistant isolates; blank = not tested.*



## Important findings in wound swab samples

Of 3,636 wound swabs, 2,132 (58.6%) were culture positive. *Pseudomonas spp.* was the commonest isolate (872; 40.9%), followed by *Klebsiella spp.* (625; 29.3%), *S. aureus* (266; 12.5%), *Acinetobacter spp*. (153; 7.2%), *E. coli* (138; 6.5%) and *Proteus spp.* (78; 3.6%).

*Pseudomonas spp.* shows high resistance to ciprofloxacin (89.1%), ceftazidime (86.1%), aztreonam (84.2%), gentamicin (83.5%), amikacin (82.7%) and piperacillin-tazobactam (75.9%); meropenem resistance was 59.6% (63.3% in 2024-25). *Klebsiella spp.* shows notable resistance to ciprofloxacin (86.7%), ceftriaxone (87.7%) and gentamicin (85.9%), and meropenem resistance increased from 54.2% to 65.4%.

*Staphylococcus aureus* displays high resistance to erythromycin (86.8%), amoxicillin (86.1%) and ciprofloxacin (80.5%); 66 isolates (24.8%) were cefoxitin-resistant (MRSA). No vancomycin resistance was detected and linezolid resistance was found in one isolate (0.4%).

*Acinetobacter spp.* exhibits very high resistance to cephalosporins (ceftriaxone 96.1%, cefuroxime 98.7%), gentamicin (90.2%) and ciprofloxacin (87.6%), with meropenem resistance of 56.2%. *E. coli* showed resistance to ciprofloxacin (84.1%), gentamicin (58.7%) and meropenem (42%), whereas Proteus spp. retained good susceptibility to meropenem (9% resistant) and piperacillin-tazobactam (12.8%). Colistin resistance was not detected in any Gram-negative isolate from wound swabs.

# Sample: Pus

## July 25 - June 26

| | |
|---|---|
| Total number of samples | 2,122 |
| Total culture positive | 867 |
| Rate of isolation of bacteria | 40.86% |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 272 | 31.37% |
| *Staphylococcus aureus* | 216 | 24.92% |
| *Pseudomonas* spp. | 160 | 18.45% |
| *E. coli* | 126 | 14.53% |
| *Acinetobacter* spp. | 74 | 8.53% |
| *Burkholderia* spp. | 0 | 0.00% |
| *Proteus* spp. | 17 | 1.96% |
| *Enterobacter* spp. | 2 | 0.24% |
| *Enterococcus* spp. | 0 | 0.00% |

# Antimicrobial resistance patterns of bacterial isolates in Pus

| Antimicrobials | *Klebsiella* spp. (n=272) | *S. aureus* (n=216) | *Pseudomonas* spp. (n=160) | *E. coli* (n=126) | *Acinetobacter* spp. (n=74) | *Burkholderia* spp. (n=0) | *Proteus* spp. (n=17) | *Enterobacter* spp. (n=2) | *Enterococcus* spp. (n=0) |
|---|---|---|---|---|---|---|---|---|---|
| **Amoxicillin** | 246 (90.44%) | 181 (83.79%) | | 115 (91.26%) | | | 15 (88.23%) | 1 (50.00%) | |
| **Cloxacillin** | | 109 (50.46%) | | | | | | | |
| **Erythromycin** | | 176 (81.48%) | | | | | | | |
| **Cephradine** | | 115 (53.24%) | | | | | | | |
| **Cotrimoxazole** | 188 (69.11%) | 78 (36.11%) | 22 (13.75%) | 87 (69.05%) | 59 (79.73%) | | 12 (70.59%) | 1 (50.00%) | |
| **Ciprofloxacin** | 221 (81.25%) | 167 (77.31%) | 105 (65.62%) | 107 (84.92%) | 62 (82.43%) | | 9 (52.94%) | 2 (100.00%) | |
| **Ceftriaxone** | 226 (83.08%) | | 21 (13.12%) | 107 (84.92%) | 66 (89.19%) | | 9 (52.94%) | 1 (50.00%) | |
| **Gentamicin** | 199 (73.16%) | 70 (32.40%) | 99 (61.87%) | 77 (61.11%) | 55 (74.32%) | | 13 (76.47%) | 0 (0.00%) | |
| **Amoxicillin-clavulanate** | 239 (87.86%) | | | 115 (91.27%) | | | 10 (58.82%) | 0 (0.00%) | |
| **Cefotaxime** | 231 (84.92%) | | | 109 (86.51%) | 59 (79.73%) | | 10 (58.82%) | 1 (50.00%) | |
| **Ceftazidime** | | | 105 (65.62%) | | 65 (87.84%) | | | | |
| **Cefuroxime** | 244 (89.71%) | | | 108 (85.71%) | 70 (94.59%) | | 11 (64.70%) | 1 (50.00%) | |
| **Amikacin** | 183 (67.28%) | | 98 (61.25%) | 74 (58.73%) | 56 (75.68%) | | 9 (52.94%) | 0 (0.00%) | |
| **Aztreonam** | | | 120 (75%) | | | | | | |
| **Azithromycin** | 252 (92.65%) | | | 118 (93.65%) | | | 12 (70.59%) | 1 (50.00%) | |
| **Meropenem** | 135 (49.63%) | | 66 (41.25%) | 54 (42.86%) | 36 (48.65%) | | 0 (0.00%) | 0 (0.00%) | |
| **Netilmicin** | | | 56 (35%) | | | | | | |
| **Cefepime** | | | 72 (45%) | | | | | | |
| **Piperacillin-tazobactam** | 106 (38.97%) | | 77 (48.12%) | 43 (34.13%) | 31 (41.89%) | | 3 (17.65%) | 0 (0.00%) | |
| **Colistin** | 0 (0.00%) | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | | | 0 (0.00%) | |
| **Cefoxitin** | 0 (0.00%) | 57 (26.39%) | | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | 0 (0.00%) | |
| **Vancomycin** | | 0 (0.00%) | | | | | | | |
| **Linezolid** | | 2 (0.92%) | | | | | | | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in pus samples

A total of 2,122 pus samples were cultured with 867 (40.9%) yielding growth. *Klebsiella spp.* (272; 31.4%) was the commonest isolate, followed by *S. aureus* (216; 24.9%), *Pseudomonas spp.* (160; 18.4%), *E. coli* (126; 14.5%) and *Acinetobacter spp.* (74; 8.5%).

*Klebsiella spp.* shows high resistance to azithromycin (92.7%), cefuroxime (89.7%), ceftriaxone (83.1%), ciprofloxacin (81.2%) and gentamicin (73.2%), with meropenem resistance rising from 39.7% to 49.6%. *S. aureus* has high resistance to amoxicillin (83.8%), erythromycin (81.5%) and ciprofloxacin (77.3%) with lower resistance to gentamicin (32.4%); cefoxitin resistance (MRSA) was 26.4% and linezolid resistance was detected in 2 isolates (0.9%), while all isolates were vancomycin susceptible.

*Pseudomonas spp.* shows considerable resistance to aztreonam (75%), ciprofloxacin (65.6%), ceftazidime (65.6%) and gentamicin (61.9%), with meropenem resistance of 41.2%. *E. coli* shows resistance to azithromycin (93.7%), ciprofloxacin (84.9%) and meropenem (42.9%). *Acinetobacter spp.* displays high resistance to cefuroxime (94.6%), ceftriaxone (89.2%) and ciprofloxacin (82.4%), with meropenem (48.6%) and piperacillin-tazobactam (41.9%) resistance.

For most Gram-negative species, meropenem now has limited efficacy in pus isolates (resistance of approximately 40-50%). However, all Gram-negative isolates remained susceptible to colistin.

# Sample: Tracheal Aspirate

## July 25 - June 26

| | |
|---|---|
| Total number of samples | **732** |
| Total culture positive | **511** |
| Rate of isolation of bacteria | **69.81%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 260 | 50.88% |
| *Acinetobacter* spp. | 133 | 26.02% |
| *Pseudomonas* spp. | 112 | 21.92% |
| *Proteus* spp. | 4 | 0.79% |
| *E. coli* | 2 | 0.39% |
| *Staphylococcus aureus* | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Tracheal Aspirate

| Antimicrobials | *Klebsiella* spp. (n=260) | *Acinetobacter* spp. (n=133) | *Pseudomonas* spp. (n=112) | *Proteus* spp. (n=4) | *E. coli* (n=2) | *S. aureus* (n=0) |
|---|---|---|---|---|---|---|
| **Amoxicillin** | 236 (90.76%) | | | 1 (25%) | 2 (100%) | 0 (0.00%) |
| **Cloxacillin** | | | | | | 0 (0.00%) |
| **Erythromycin** | | | | | | 0 (0.00%) |
| **Cephradine** | | | | | | 0 (0.00%) |
| **Cotrimoxazole** | 246 (94.61%) | 114 (85.71%) | | 4 (100%) | 2 (100%) | 0 (0.00%) |
| **Ciprofloxacin** | 260 (100%) | 128 (96.24%) | 96 (85.71%) | 4 (100%) | 2 (100%) | 0 (0.00%) |
| **Ceftriaxone** | 258 (99.23%) | 129 (96.99%) | 6 (5.35%) | 3 (75%) | 2 (100%) | |
| **Gentamicin** | 228 (87.69%) | 122 (91.72%) | 104 (92.85%) | 3 (75%) | 2 (100%) | 0 (0.00%) |
| **Amoxicillin-clavulanate** | 247 (95%) | | | 1 (25%) | 2 (100%) | |
| **Cefotaxime** | 257 (98.84%) | 114 (85.71%) | | 3 (75%) | 2 (100%) | |
| **Ceftazidime** | | 127 (95.48%) | 89 (79.46%) | | | |
| **Cefuroxime** | 251 (96.53%) | 126 (94.73%) | | 3 (75%) | 2 (100%) | |
| **Amikacin** | 254 (97.69%) | 129 (96.99%) | 104 (92.85%) | 2 (50%) | 2 (100%) | |
| **Aztreonam** | | | 5 (4.46%) | | | |
| **Azithromycin** | 251 (96.53%) | | | 1 (25%) | 2 (100%) | |
| **Meropenem** | 249 (95.76%) | 127 (95.48%) | 90 (80.35%) | 1 (25%) | 2 (100%) | |
| **Netilmicin** | | | 79 (70.53%) | | | |
| **Cefepime** | | | 72 (64.28%) | | | |
| **Piperacillin-tazobactam** | 184 (70.76%) | 88 (66.16%) | 89 (79.46%) | 1 (25%) | 2 (100%) | |
| **Colistin** | 3 (1.15%) | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in tracheal aspirate samples

Tracheal aspirates had the highest culture positivity of all specimens (69.8%), with *Klebsiella spp.* (260; 50.9%), *Acinetobacter spp.* (133; 26%) and *Pseudomonas spp.* (112; 21.9%) predominating. *Klebsiella spp.* exhibits resistance to ciprofloxacin (100%), ceftriaxone (99.2%), amikacin (97.7%), cotrimoxazole (94.6%) and gentamicin (87.7%), and meropenem resistance reached 95.8% (93.4% in 2024-25). *Acinetobacter spp.* shows very high resistance to ceftriaxone (97%), amikacin (97%), ciprofloxacin (96.2%), gentamicin (91.7%) and meropenem (95.5%).

*Pseudomonas spp.* demonstrates significant resistance to gentamicin and amikacin (92.8% each), ciprofloxacin (85.7%), meropenem (80.3%) and piperacillin-tazobactam (79.5%). Colistin remained active against almost all isolates.

## Sample: Throat Swab

### July 25 - June 26

| | |
|---|---|
| Total number of samples | **426** |
| Total culture positive | **176** |
| Rate of isolation of bacteria | **41.31%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 141 | 80.11% |
| *Acinetobacter* spp. | 21 | 11.93% |
| *Pseudomonas* spp. | 14 | 7.96% |
| *Staphylococcus aureus* | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Throat Swab

| Antimicrobials | *Klebsiella* spp. (n=141) | *Acinetobacter* spp. (n=21) | *Pseudomonas* spp. (n=14) | *S. aureus* (n=0) |
|---|---|---|---|---|
| **Amoxicillin** | 126 (89.36%) | | | 0 (0.00%) |
| **Cloxacillin** | | | | 0 (0.00%) |
| **Erythromycin** | | | | 0 (0.00%) |
| **Cephradine** | | | | 0 (0.00%) |
| **Cotrimoxazole** | 123 (87.23%) | 15 (71.42%) | | 0 (0.00%) |
| **Ciprofloxacin** | 110 (78.01%) | 18 (85.71%) | 14 (100%) | 0 (0.00%) |
| **Ceftriaxone** | 127 (90.07%) | 21 (100%) | 0 (0.00%) | |
| **Gentamicin** | 86 (60.99%) | 19 (90.47%) | 14 (100%) | 0 (0.00%) |
| **Amoxicillin-clavulanate** | 131 (92.90%) | | | |
| **Cefotaxime** | 125 (88.65%) | 21 (100%) | | |
| **Ceftazidime** | | 21 (100%) | 13 (92.85%) | |
| **Cefuroxime** | 128 (90.78%) | 21 (100%) | | |
| **Amikacin** | 119 (84.39%) | 19 (90.47%) | | |
| **Aztreonam** | | | 12 (85.71%) | |
| **Azithromycin** | 132 (93.61%) | | | |
| **Meropenem** | 106 (75.17%) | 19 (90.47%) | 11 (78.57%) | |
| **Cefepime** | | | 8 (57.14%) | |
| **Piperacillin-tazobactam** | 75 (53.19%) | 11 (52.38%) | 14 (100%) | |
| **Colistin** | 2 (2.12%) | 0 (0.00%) | 0 (0.00%) | |
| **Cefoxitin** | | | | 0 (0.00%) |
| **Vancomycin** | | | | 0 (0.00%) |
| **Linezolid** | | | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in throat swab samples

Of 426 throat swabs, 176 (41.3%) were culture positive. *Klebsiella spp.* (141; 80.1%) was the predominant isolate, followed by *Acinetobacter spp.* (21; 11.9%) and *Pseudomonas spp.* (14; 8%).

*Klebsiella spp.* shows significant resistance to azithromycin (93.6%), ceftriaxone (90.1%), cotrimoxazole (87.2%), amikacin (84.4%) and ciprofloxacin (78%), with meropenem resistance of 75.2% (71.3% in 2024-25). *Acinetobacter spp.* was resistant to all tested cephalosporins (100%) and to gentamicin, amikacin and meropenem (90.5% each), while *Pseudomonas spp.* was resistant to ciprofloxacin, gentamicin and piperacillin-tazobactam in all isolates, with meropenem resistance of 78.6%. Colistin remained highly effective (resistance only in 2 Klebsiella isolates).

## Sample: CSF

### July 25 - June 26

| | |
|---|---|
| Total number of samples | **475** |
| Total culture positive | **14** |
| Rate of isolation of bacteria | **2.95%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Acinetobacter* spp. | 5 | 35.71% |
| *Pseudomonas* spp. | 5 | 35.71% |
| *Klebsiella* spp. | 4 | 28.58% |

## Antimicrobial resistance patterns of bacterial isolates in CSF

| Antimicrobials | *Acinetobacter* spp. (n=5) | *Klebsiella* spp. (n=4) | *Pseudomonas* spp. (n=5) |
|---|---|---|---|
| **Amoxicillin** | | 2 (50%) | |
| **Cotrimoxazole** | 4 (80%) | 2 (50%) | |
| **Ciprofloxacin** | 4 (80%) | 3 (75%) | 3 (60%) |
| **Ceftriaxone** | 5 (100%) | 3 (75%) | |
| **Gentamicin** | 5 (100%) | 1 (25%) | 4 (80%) |
| **Cefotaxime** | 5 (100%) | 3 (75%) | |
| **Ceftazidime** | 4 (80%) | 1 (25%) | 3 (60%) |
| **Cefuroxime** | 5 (100%) | 3 (75%) | |
| **Amikacin** | 3 (60%) | 2 (50%) | 2 (40%) |
| **Azithromycin** | | 3 (75%) | |
| **Meropenem** | 5 (100%) | 1 (25%) | 2 (40%) |
| **Piperacillin-tazobactam** | 3 (60%) | 1 (25%) | 1 (20%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in CSF samples

Only 14 of 475 CSF samples (3%) yielded growth: *Acinetobacter spp.* (5), *Pseudomonas spp.* (5) and *Klebsiella spp.* (4), all likely healthcare-associated (post-neurosurgical) pathogens.

*Acinetobacter spp.* was completely resistant to ceftriaxone, cefotaxime, cefuroxime, gentamicin and meropenem, with 80% resistance to ciprofloxacin, cotrimoxazole and ceftazidime. *Klebsiella spp.* showed 75% resistance to ciprofloxacin and third-generation cephalosporins but lower resistance to meropenem and piperacillin-tazobactam (25%). *Pseudomonas spp.* was resistant to gentamicin (80%), ciprofloxacin and ceftazidime (60%) and meropenem (40%). Colistin showed no resistance. Given the small numbers, these percentages should be interpreted with caution.

# Sample: Bronchoalveolar Lavage

## July 25 - June 26

| | |
|---|---|
| Total number of samples | **429** |
| Total culture positive | **197** |
| Rate of isolation of bacteria | **45.92%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Pseudomonas* spp. | 114 | 57.87% |
| *Klebsiella* spp. | 59 | 29.96% |
| *Acinetobacter* spp. | 18 | 9.14% |
| *E. coli* | 2 | 1.01% |
| *Staphylococcus aureus* | 2 | 1.01% |
| *Proteus* spp. | 2 | 1.01% |

## Antimicrobial resistance patterns of bacterial isolates in Bronchoalveolar Lavag

| Antimicrobials | *Klebsiella* spp. (n=59) | *Pseudomonas* spp. (n=114) | *Acinetobacter* spp. (n=18) | *E. coli* (n=2) | *S. aureus* (n=2) | *Proteus* spp. (n=2) |
|---|---|---|---|---|---|---|
| **Amoxicillin** | 47 (79.66%) | | | 2 (100.00%) | 2 (100.00%) | 1 (50.00%) |
| **Cloxacillin** | | | | | 1 (50.00%) | |
| **Erythromycin** | | | | | 2 (100.00%) | |
| **Cephradine** | | | | | 2 (100.00%) | |
| **Cotrimoxazole** | 34 (57.63%) | | 13 (72.22%) | 2 (100.00%) | 0 (0.00%) | 1 (50.00%) |
| **Ciprofloxacin** | 45 (76.27%) | 82 (71.93%) | 14 (77.78%) | 2 (100.00%) | 2 (100.00%) | 2 (100.00%) |
| **Ceftriaxone** | 41 (69.49%) | 2 (1.75%) | 13 (72.22%) | 2 (100.00%) | | 2 (100.00%) |
| **Gentamicin** | 38 (64.41%) | 78 (68.42%) | 15 (83.33%) | 2 (100.00%) | | 1 (50.00%) |
| **Amoxicillin-clavulanate** | 48 (81.35%) | | | 2 (100.00%) | | 0 (0.00%) |
| **Cefotaxime** | 44 (74.58%) | | 12 (66.67%) | 2 (100.00%) | | 2 (100.00%) |
| **Ceftazidime** | | 30 (26.31%) | 13 (72.22%) | | | |
| **Cefuroxime** | 45 (76.27%) | | 16 (88.89%) | 2 (100.00%) | | 2 (100.00%) |
| **Amikacin** | 38 (64.41%) | 72 (63.16%) | 14 (77.78%) | 2 (100.00%) | | 2 (100.00%) |
| **Aztreonam** | | 62 (54.38%) | | | | |
| **Azithromycin** | 52 (88.13%) | | | 2 (100.00%) | | 1 (50.00%) |
| **Meropenem** | 16 (27.12%) | 16 (14.03%) | 11 (61.11%) | 0 (0.00%) | | 0 (0.00%) |
| **Netilmicin** | | 61 (53.51%) | | | | |
| **Cefepime** | | 49 (42.98%) | | | | |
| **Piperacillin-tazobactam** | 12 (20.34%) | 24 (21.05%) | 8 (44.45%) | 2 (100.00%) | | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | | |
| **Cefoxitin** | | | | | 1 (50.00%) | |
| **Vancomycin** | | | | | 0 (0.00%) | |
| **Linezolid** | | | | | 0 (0.00%) | |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in bronchoalveolar lavage samples

Of 429 BAL samples, 197 (45.9%) were culture positive. *Pseudomonas spp.* (114; 57.9%) was the most common isolate, followed by *Klebsiella spp.* (59; 30%) and *Acinetobacter spp.* (18; 9.1%).

*Pseudomonas spp.* displays resistance to ciprofloxacin (71.9%) and gentamicin (68.4%), while meropenem (14%) and piperacillin-tazobactam (21.1%) remain comparatively effective. Meropenem resistance was 27.1% in *Klebsiella spp.* (ciprofloxacin 76.3%) and 61.1% in *Acinetobacter spp.* (gentamicin 83.3%) – much lower than in tracheal aspirates; colistin remained effective.

# Sample: Ascitic Fluid
## July 25 - June 26

| | |
|---|---|
| Total number of samples | **463** |
| Total culture positive | **27** |
| Rate of isolation of bacteria | **5.83%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *E. coli* | 10 | 37.04% |
| *Klebsiella* spp. | 6 | 22.22% |
| *Pseudomonas* spp. | 5 | 18.52% |
| *Acinetobacter* spp. | 5 | 18.52% |
| *Proteus* spp. | 1 | 3.70% |
| *Staphylococcus aureus* | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Ascitic Fluid

| Antimicrobials | *E. coli* (n=10) | *Acinetobacter* spp. (n=5) | *Pseudomonas* spp. (n=5) | *Proteus* spp. (n=1) | *Klebsiella* spp. (n=6) | *S. aureus* (n=0) |
|---|---|---|---|---|---|---|
| **Amoxicillin** | 10 (100%) | | | 1 (100%) | 3 (100%) | 0 (0.00%) |
| **Cloxacillin** | | | | | | 0 (0.00%) |
| **Erythromycin** | | | | | | 0 (0.00%) |
| **Cephradine** | | | | | | 0 (0.00%) |
| **Cotrimoxazole** | 7 (70%) | 5 (100%) | | 1 (100%) | 2 (66.66%) | 0 (0.00%) |
| **Ciprofloxacin** | 10 (100%) | 5 (100%) | 5 (100%) | 1 (100%) | 3 (100%) | 0 (0.00%) |
| **Ceftriaxone** | 9 (90%) | 5 (100%) | 0 (0.00%) | 0 (0.00%) | 3 (100%) | |
| **Gentamicin** | 8 (80%) | 4 (80%) | 5 (100%) | 0 (0.00%) | 2 (66.66%) | |
| **Amoxicillin-clavulanate** | 10 (100%) | | | 0 (0.00%) | 2 (66.66%) | |
| **Cefotaxime** | 10 (100%) | 5 (100%) | | 0 (0.00%) | 3 (100%) | |
| **Ceftazidime** | | 5 (100%) | 4 (80%) | | | |
| **Cefuroxime** | 10 (100%) | 4 (80%) | | 1 (100%) | 3 (100%) | |
| **Amikacin** | 2 (66.66%) | 4 (80%) | 5 (100%) | | 1 (33.33%) | |
| **Aztreonam** | 9 (90%) | | | | | |
| **Azithromycin** | 0 (0.00%) | | | 1 (100%) | 3 (100%) | |
| **Meropenem** | 1 (10%) | 2 (40%) | 4 (80%) | 0 (0.00%) | 2 (66.66%) | |
| **Cefepime** | | | 4 (80%) | | | |
| **Piperacillin-tazobactam** | 4 (40%) | 2 (40%) | 0 (0.00%) | 0 (0.00%) | 1 (33.33%) | |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | | 0 (0.00%) | |
| **Cefoxitin** | | | | | | 0 (0.00%) |
| **Vancomycin** | | | | | | 0 (0.00%) |
| **Linezolid** | | | | | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in ascitic fluid samples

27 of 463 ascitic fluid samples (5.8%) were culture positive; *E. coli* (10; 37%) was the commonest isolate, followed by *Klebsiella spp.* (6; 22.2%).

*E. coli* was resistant to ciprofloxacin and cephalosporins in 90-100% of isolates, but showed low resistance to meropenem (10%) and piperacillin-tazobactam (40%). *Klebsiella spp.* and *Acinetobacter spp.* were fully resistant to ciprofloxacin and third-generation cephalosporins (meropenem resistance 66.7% and 40%, respectively). *Pseudomonas spp.* resisted ciprofloxacin and aminoglycosides (meropenem 80%) but not piperacillin-tazobactam; no colistin resistance.

## Sample: Aural Swab
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **67** |
| Total culture positive | **15** |
| Rate of isolation of bacteria | **22.39%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Staphylococcus aureus* | 3 | 20.00% |
| *Pseudomonas* spp. | 6 | 40.00% |
| *Acinetobacter* spp. | 1 | 6.67% |
| *Klebsiella* spp. | 5 | 33.33% |

## Antimicrobial resistance patterns of bacterial isolates in Aural Swab

| Antimicrobials | *S. aureus* (n=3) | *Pseudomonas* spp. (n=6) | *Acinetobacter* spp. (n=1) | *Klebsiella* spp. (n=5) |
|---|---|---|---|---|
| **Amoxicillin** | 2 (66.67%) | | | 5 (100.00%) |
| **Cloxacillin** | 1 (33.34%) | | | |
| **Erythromycin** | 2 (66.67%) | | | |
| **Cephradine** | 2 (66.67%) | | | |
| **Cotrimoxazole** | 1 (33.34%) | | 0 (0.00%) | 5 (100.00%) |
| **Ciprofloxacin** | 2 (66.67%) | 6 (100.00%) | 0 (0.00%) | 4 (80.00%) |
| **Ceftriaxone** | | | 0 (0.00%) | 3 (60.00%) |
| **Gentamicin** | 1 (33.34%) | 6 (100.00%) | 1 (100.00%) | 2 (40.00%) |
| **Amoxicillin-clavulanate** | | | | 5 (100.00%) |
| **Cefotaxime** | | | 0 (0.00%) | 3 (60.00%) |
| **Ceftazidime** | | 5 (83.34%) | 0 (0.00%) | |
| **Cefuroxime** | | | 1 (100.00%) | 3 (60.00%) |
| **Amikacin** | | 6 (100.00%) | 0 (0.00%) | 2 (40.00%) |
| **Aztreonam** | | 6 (100.00%) | | |
| **Azithromycin** | | | | 5 (100.00%) |
| **Meropenem** | | 4 (66.67%) | 0 (0.00%) | 3 (60.00%) |
| **Netilmicin** | | 4 (66.67%) | | |
| **Cefepime** | | 4 (66.67%) | | |
| **Piperacillin-tazobactam** | | 2 (33.34%) | 0 (0.00%) | 3 (60.00%) |
| **Colistin** | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Cefoxitin** | 2 (66.67%) | | | |
| **Vancomycin** | 0 (0.00%) | | | |
| **Linezolid** | 0 (0.00%) | | | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in aural swab samples

15 of 67 aural swabs (22.4%) were culture positive, yielding *Pseudomonas spp.* (6; 40%), *Klebsiella spp.* (5; 33.3%), *S. aureus* (3; 20%) and *Acinetobacter spp.* (1).

*Pseudomonas spp.* was resistant to ciprofloxacin, gentamicin, amikacin and aztreonam in all isolates, to ceftazidime in 83.3% and to meropenem in 66.7%; piperacillin-tazobactam resistance was 33.3%. *Klebsiella spp.* was resistant to cotrimoxazole and amoxicillin-clavulanate in all isolates, with meropenem resistance of 60%. Two of three *S. aureus* were MRSA; all were vancomycin and linezolid susceptible. No colistin resistance was seen.

## Sample: Oral Swab
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **35** |
| Total culture positive | **13** |
| Rate of isolation of bacteria | **37.14%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Staphylococcus aureus* | 2 | 15.39% |
| *Pseudomonas* spp. | 1 | 7.69% |
| *Acinetobacter* spp. | 6 | 46.15% |
| *Klebsiella* spp. | 4 | 30.77% |

## Antimicrobial resistance patterns of bacterial isolates in Oral Swab

| Antimicrobials | *S. aureus* (n=2) | *Pseudomonas* spp. (n=1) | *Acinetobacter* spp. (n=6) | *Klebsiella* spp. (n=4) |
|---|---|---|---|---|
| **Amoxicillin** | 2 (100.00%) | | | 4 (100%) |
| **Cloxacillin** | 2 (100.00%) | | | |
| **Erythromycin** | 2 (100.00%) | | | |
| **Cephradine** | 2 (100.00%) | | | |
| **Cotrimoxazole** | 2 (100.00%) | | 4 (66.67%) | 2 (50.00%) |
| **Ciprofloxacin** | | 1 (100.00%) | 3 (50.00%) | 3 (75.00%) |
| **Ceftriaxone** | | | 4 (66.67%) | 4 (100.00%) |
| **Gentamicin** | 2 (100.00%) | 1 (100.00%) | 2 (33.33%) | 4 (100.00%) |
| **Amoxicillin-clavulanate** | | | 1 (66.67%) | 4 (100.00%) |
| **Cefotaxime** | | | 5 (83.34%) | 4 (100.00%) |
| **Ceftazidime** | | 0 (0.00%) | 1 (66.67%) | |
| **Cefuroxime** | | | 3 (50.00%) | 4 (100.00%) |
| **Amikacin** | | 0 (0.00%) | 1 (66.67%) | 3 (75.00%) |
| **Aztreonam** | | 0 (0.00%) | | |
| **Azithromycin** | | | | 4 (100.00%) |
| **Meropenem** | | 0 (0.00%) | 1 (66.67%) | 3 (75.00%) |
| **Netilmicin** | | 0 (0.00%) | | |
| **Cefepime** | | 0 (0.00%) | | |
| **Piperacillin-tazobactam** | | 0 (0.00%) | 0 (0.00%) | 4 (100.00%) |
| **Colistin** | | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Cefoxitin** | 0 (0.00%) | | | |
| **Vancomycin** | 0 (0.00%) | | | |
| **Linezolid** | 0 (0.00%) | | | |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in oral swab samples

Oral swabs are reported separately for the first time this year. 13 of 35 samples (37.1%) yielded growth: *Acinetobacter spp.* (6; 46.1%), *Klebsiella spp.* (4; 30.8%), *S. aureus* (2) and *Pseudomonas spp.* (1).

*Klebsiella spp.* showed resistance to ceftriaxone, gentamicin, amoxicillin-clavulanate, cephalosporins, azithromycin and piperacillin-tazobactam in all isolates, and 75% were meropenem resistant. *Acinetobacter spp.* showed variable resistance, highest to cefotaxime (83.3%). Both *S. aureus* isolates were cefoxitin susceptible and remained susceptible to vancomycin and linezolid. No colistin resistance was detected.

## Sample: Nasal Swab
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **64** |
| Total culture positive | **11** |
| Rate of isolation of bacteria | **17.19%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Staphylococcus aureus* | 9 | 81.82% |
| *Acinetobacter* spp. | 1 | 9.09% |
| *Pseudomonas* spp. | 1 | 9.09% |

## Antimicrobial resistance patterns of bacterial isolates in Nasal Swab

| Antimicrobials | *Acinetobacter* spp. (n=1) | *S. aureus* (n=9) | *Pseudomonas* spp. (n=1) |
|---|---|---|---|
| **Amoxicillin** | | 7 (77.78%) | |
| **Cloxacillin** | | 5 (55.55%) | |
| **Erythromycin** | | 9 (100%) | |
| **Cephradine** | | 8 (88.89%) | |
| **Cotrimoxazole** | 0 (0.00%) | 5 (55.55%) | |
| **Ciprofloxacin** | 0 (0.00%) | 7 (77.78%) | 1 (100%) |
| **Ceftriaxone** | 1 (100%) | | |
| **Gentamicin** | 0 (0.00%) | 7 (77.78%) | 1 (100%) |
| **Cefotaxime** | 1 (100%) | | |
| **Ceftazidime** | 1 (100%) | | 1 (100%) |
| **Cefuroxime** | 1 (100%) | | |
| **Amikacin** | 0 (0.00%) | | 0 (0.00%) |
| **Aztreonam** | | | 1 (100%) |
| **Meropenem** | 0 (0.00%) | | 1 (100%) |
| **Netilmicin** | | | 0 (0.00%) |
| **Cefepime** | | | 1 (100%) |
| **Piperacillin-tazobactam** | 0 (0.00%) | | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | | 0 (0.00%) |
| **Cefoxitin** | | 5 (55.55%) | |
| **Vancomycin** | | 0 (0.00%) | |
| **Linezolid** | | 0 (0.00%) | |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in nasal swab samples

11 of 64 nasal swabs (17.2%) were culture positive; *S. aureus* was the predominant isolate (9; 81.8%). *S. aureus* showed resistance to erythromycin (100%), cephradine (88.9%), amoxicillin, ciprofloxacin and gentamicin (77.8% each), and 5 isolates (55.5%) were cefoxitin resistant (MRSA), indicating MRSA nasal carriage. All isolates were susceptible to vancomycin and, unlike last year (28.6%), to linezolid. The single Pseudomonas isolate was resistant to ciprofloxacin, gentamicin, ceftazidime and meropenem.

## Sample: Bile
## July 25 - June 26

| | |
|---|---|
| Total number of samples | **106** |
| Total culture positive | **34** |
| Rate of isolation of bacteria | **32.08%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 22 | 64.70% |
| *E. coli* | 10 | 29.42% |
| *Pseudomonas* spp. | 1 | 2.94% |
| *Acinetobacter* spp. | 1 | 2.94% |

## Antimicrobial resistance patterns of bacterial isolates in Bile

| Antimicrobials | *Klebsiella* spp. (n=22) | *E. coli* (n=10) | *Pseudomonas* spp. (n=1) | *Acinetobacter* spp. (n=1) |
|---|---|---|---|---|
| **Amoxicillin** | 20 (90.91%) | 8 (80.00%) | | |
| **Cotrimoxazole** | 18 (81.82%) | 6 (60.00%) | | 1 (100.00%) |
| **Ciprofloxacin** | 20 (90.91%) | 8 (80.00%) | 1 (100.00%) | 1 (100.00%) |
| **Ceftriaxone** | 20 (90.91%) | 9 (90.00%) | | 1 (100.00%) |
| **Gentamicin** | 15 (68.19%) | 6 (60.00%) | 1 (100.00%) | 0 (0.00%) |
| **Amoxicillin-clavulanate** | 18 (81.82%) | 6 (60.00%) | | |
| **Cefotaxime** | 20 (90.91%) | 8 (80.00%) | | 1 (100.00%) |
| **Ceftazidime** | | | 1 (100.00%) | 1 (100.00%) |
| **Cefuroxime** | 18 (81.82%) | 8 (80.00%) | | 1 (100.00%) |
| **Amikacin** | 13 (59.09%) | 5 (50.00%) | 0 (0.00%) | 0 (0.00%) |
| **Aztreonam** | | | 1 (100.00%) | |
| **Azithromycin** | 19 (86.36%) | 9 (90.00%) | | |
| **Meropenem** | 14 (63.64%) | 4 (40.00%) | 1 (100.00%) | 0 (0.00%) |
| **Netilmicin** | | | 0 (0.00%) | |
| **Cefepime** | | | 0 (0.00%) | |
| **Piperacillin-tazobactam** | 11 (50.00%) | 2 (20.00%) | 1 (100.00%) | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in bile samples

34 of 106 bile samples (32.1%) were culture positive, mostly *Klebsiella spp.* (22; 64.7%) and *E. coli* (10; 29.4%).

*Klebsiella spp.* demonstrated widespread resistance to amoxicillin, ciprofloxacin, ceftriaxone and cefotaxime (90.9% each), azithromycin (86.4%) and cotrimoxazole (81.8%), with meropenem resistance of 63.6% and piperacillin-tazobactam resistance of 50%. *E. coli* exhibited resistance to ceftriaxone and azithromycin (90%), ciprofloxacin (80%) and meropenem (40%), but lower resistance to piperacillin-tazobactam (20%). Colistin was the only antimicrobial showing no resistance across all species.

## Sample: Nipple Discharge
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **39** |
| Total culture positive | **8** |
| Rate of isolation of bacteria | **20.51%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Staphylococcus aureus* | 8 | 100.00% |
| *Klebsiella* spp. | 0 | 0.00% |
| *Pseudomonas* spp. | 0 | 0.00% |
| *Proteus* spp. | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Nipple Discharge

| Antimicrobials | *Klebsiella* spp. (n=0) | *S. aureus* (n=8) | *Pseudomonas* spp. (n=0) | *Proteus* spp. (n=0) |
|---|---|---|---|---|
| **Amoxicillin** | | 6 (75.00%) | | |
| **Cloxacillin** | | 4 (50.00%) | | |
| **Erythromycin** | | 8 (100.00%) | | |
| **Cephradine** | | 5 (62.50%) | | |
| **Cotrimoxazole** | | 4 (50.00%) | | |
| **Ciprofloxacin** | | 7 (87.50%) | | |
| **Gentamicin** | | 4 (50.00%) | | |
| **Cefoxitin** | | 1 (12.50%) | | |
| **Vancomycin** | | 0 (0.00%) | | |
| **Linezolid** | | 0 (0.00%) | | |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in nipple discharge samples

8 of 39 nipple discharge samples (20.5%) were culture positive and all isolates were *S. aureus*.

*S. aureus* showed resistance to erythromycin (100%), ciprofloxacin (87.5%), amoxicillin (75%) and cephradine (62.5%), with 50% resistance to cloxacillin, cotrimoxazole and gentamicin. One isolate (12.5%) was cefoxitin resistant (MRSA). Resistance to vancomycin and linezolid was absent.

## Sample: Pleural Fluid
## July 25 - June 26

| | |
|---|---|
| Total number of samples | **501** |
| Total culture positive | **31** |
| Rate of isolation of bacteria | **6.19%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Pseudomonas* spp. | 14 | 45.16% |
| *Acinetobacter* spp. | 3 | 9.68% |
| *Klebsiella* spp. | 10 | 32.25% |
| *E. coli* | 4 | 12.91% |

## Antimicrobial resistance patterns of bacterial isolates in Pleural Fluid

| Antimicrobials | *Klebsiella* spp. (n=10) | *E. coli* (n=4) | *Acinetobacter* spp. (n=3) | *Pseudomonas* spp. (n=14) |
|---|---|---|---|---|
| **Amoxicillin** | 10 (100.00%) | 3 (75.00%) | | |
| **Cotrimoxazole** | 8 (80.00%) | 4 (100.00%) | 3 (100.00%) | |
| **Ciprofloxacin** | 6 (60.00%) | 4 (100.00%) | 2 (66.67%) | 11 (78.57%) |
| **Ceftriaxone** | 8 (80.00%) | 4 (100.00%) | 3 (100.00%) | |
| **Gentamicin** | 6 (60.00%) | 3 (75.00%) | 2 (66.67%) | 12 (85.71%) |
| **Amoxicillin-clavulanate** | 8 (80.00%) | 4 (100.00%) | | |
| **Cefotaxime** | 5 (50.00%) | 4 (100.00%) | 3 (100.00%) | |
| **Ceftazidime** | | | 3 (100.00%) | 7 (50.00%) |
| **Cefuroxime** | 8 (80.00%) | 4 (100.00%) | 3 (100.00%) | |
| **Amikacin** | 6 (60.00%) | 4 (100.00%) | 3 (100.00%) | 10 (71.42%) |
| **Aztreonam** | | | | 9 (64.28%) |
| **Azithromycin** | 9 (90.00%) | 3 (75.00%) | | |
| **Meropenem** | 4 (40.00%) | 4 (100.00%) | 2 (66.67%) | 7 (50.00%) |
| **Netilmicin** | | | | 6 (42.86%) |
| **Cefepime** | | | | 5 (35.71%) |
| **Piperacillin-tazobactam** | 4 (40.00%) | 3 (75.00%) | 2 (66.67%) | 8 (57.14%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in pleural fluid samples

31 of 501 pleural fluid samples (6.2%) yielded growth: *Pseudomonas spp.* (14; 45.2%), *Klebsiella spp.* (10; 32.2%), *E. coli* (4; 12.9%) and *Acinetobacter spp.* (3; 9.7%).

*Pseudomonas spp.* demonstrated resistance to gentamicin (85.7%), ciprofloxacin (78.6%), amikacin (71.4%) and meropenem (50%). Klebsiella spp. showed high resistance to azithromycin (90%), cotrimoxazole and ceftriaxone (80% each), with meropenem and piperacillin-tazobactam resistance of 40%. All four *E. coli* isolates were resistant to ciprofloxacin, ceftriaxone, amikacin and meropenem, and *Acinetobacter spp.* was resistant to cephalosporins and amikacin in all isolates. Colistin showed no resistance across all species, indicating its potential effectiveness.

## Sample: High Vaginal Swab
## July 25 - June 26

| | |
|---|---|
| Total number of samples | **350** |
| Total culture positive | **9** |
| Rate of isolation of bacteria | **2.57%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 9 | 100.00% |
| *Acinetobacter* spp. | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in High Vaginal Swab

| Antimicrobials | *Klebsiella* spp. (n=9) | *Acinetobacter* spp. (n=0) |
|---|---|---|
| **Amoxicillin** | 9 (100.00%) | |
| **Cotrimoxazole** | 2 (22.22%) | |
| **Ciprofloxacin** | 5 (55.55%) | |
| **Ceftriaxone** | 5 (55.55%) | |
| **Gentamicin** | 6 (66.66%) | |
| **Amoxicillin-clavulanate** | 5 (55.55%) | |
| **Cefotaxime** | 5 (55.55%) | |
| **Cefuroxime** | 5 (55.55%) | |
| **Amikacin** | 6 (66.66%) | |
| **Azithromycin** | 9 (100.00%) | |
| **Meropenem** | 4 (44.44%) | |
| **Piperacillin-tazobactam** | 2 (22.22%) | |
| **Colistin** | 0 (0.00%) | |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in high vaginal samples

9 of 350 high vaginal swabs (2.6%) were culture positive and all isolates were *Klebsiella spp.*

*Klebsiella spp.* showed resistance to amoxicillin and azithromycin in all isolates, to gentamicin and amikacin (66.7% each), and to ciprofloxacin, ceftriaxone, cefotaxime and amoxicillin-clavulanate (55.5% each). Meropenem resistance was 44.4%, while resistance to cotrimoxazole and piperacillin-tazobactam was 22.2%. Colistin showed no resistance.

## Sample: Endotracheal Tube
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **143** |
| Total culture positive | **28** |
| Rate of isolation of bacteria | **19.58%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Pseudomonas* spp. | 13 | 46.43% |
| *Klebsiella* spp. | 9 | 32.14% |
| *Acinetobacter* spp. | 5 | 17.86% |
| *Staphylococcus aureus* | 1 | 3.57% |
| *E. coli* | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Endotracheal Tube

| Antimicrobials | *Pseudomonas* spp. (n=13) | *Acinetobacter* spp. (n=5) | *Klebsiella* spp. (n=9) | *E. coli* (n=0) | *S. aureus* (n=1) |
|---|---|---|---|---|---|
| **Amoxicillin** | | | 9 (100%) | | 1 (100%) |
| **Cloxacillin** | | | | | 1 (100%) |
| **Erythromycin** | | | | | 1 (100%) |
| **Cephradine** | | | | | 1 (100%) |
| **Cotrimoxazole** | 3 (23.07%) | 5 (100%) | 8 (88.88%) | | 0 (0.00%) |
| **Ciprofloxacin** | 8 (61.53%) | 4 (80%) | 8 (88.88%) | | 1 (100%) |
| **Ceftriaxone** | 0 (0.00%) | 5 (100%) | 8 (88.88%) | | |
| **Gentamicin** | 10 (76.92%) | 3 (60%) | 8 (88.88%) | | 0 (0.00%) |
| **Cefotaxime** | 0 (0.00%) | 5 (100%) | 6 (66.66%) | | |
| **Ceftazidime** | 7 (53.84%) | 5 (100%) | 0 (0.00%) | | |
| **Cefuroxime** | | | 9 (100%) | | |
| **Amikacin** | 10 (76.92%) | 4 (80%) | 6 (66.66%) | | |
| **Aztreonam** | 0 (0.00%) | | 0 (0.00%) | | |
| **Meropenem** | 9 (69.23%) | 3 (60%) | 7 (77.77%) | | |
| **Netilmicin** | 4 (30.76%) | | 1 (33.33%) | | |
| **Cefepime** | 4 (30.76%) | | | | |
| **Piperacillin-tazobactam** | 8 (61.53%) | 2 (40%) | 5 (55.55%) | | |
| **Colistin** | 0 (0.00%) | 1 (20%) | 0 (0.00%) | | |
| **Cefoxitin** | | | | | 0 (0.00%) |
| **Vancomycin** | | | | | 0 (0.00%) |
| **Linezolid** | | | | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in endotracheal tube samples

28 of 143 endotracheal tube samples (19.6%) were culture positive: *Pseudomonas spp.* (13; 46.4%), *Klebsiella spp.* (9; 32.1%), *Acinetobacter spp.* (5; 17.9%) and *S. aureus* (1).

*Pseudomonas spp.* exhibited resistance to gentamicin and amikacin (76.9% each), meropenem (69.2%), ciprofloxacin and piperacillin-tazobactam (61.5% each), while remaining fully susceptible to colistin. *Klebsiella spp.* showed high resistance to ciprofloxacin, ceftriaxone, gentamicin and cotrimoxazole (88.9% each) and to meropenem (77.8%). *Acinetobacter spp.* was resistant to cephalosporins and cotrimoxazole in all isolates, with meropenem resistance of 60%; notably, one Acinetobacter isolate was colistin resistant.

## Sample: Central Venous Catheter
## July 25 - June 26

| | |
|---|---|
| Total number of samples | **141** |
| Total culture positive | **18** |
| Rate of isolation of bacteria | **12.77%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 10 | |
| *Pseudomonas* spp. | 6 | |
| *E. coli* | 1 | |
| *Acinetobacter* spp. | 1 | |

## Antimicrobial resistance patterns of bacterial isolates in Central Venous Catheter

| Antimicrobials | *Klebsiella* spp. (n=10) | *Pseudomonas* spp. (n=6) | *E. coli* (n=1) | *Acinetobacter* spp. (n=1) |
|---|---|---|---|---|
| **Amoxicillin** | 10 (100%) | | 1 (100%) | |
| **Cotrimoxazole** | 8 (80%) | | 1 (100%) | 1 (100%) |
| **Ciprofloxacin** | 8 (80%) | 1 (16.66%) | 1 (100%) | 1 (100%) |
| **Ceftriaxone** | 9 (90%) | 0 (0.00%) | 1 (100%) | 1 (100%) |
| **Gentamicin** | 7 (70%) | 4 (66.66%) | 1 (100%) | 1 (100%) |
| **Amoxicillin-clavulanate** | 9 (90%) | | 1 (100%) | |
| **Cefotaxime** | 9 (90%) | | 1 (100%) | |
| **Ceftazidime** | | 3 (50%) | | |
| **Cefuroxime** | 10 (100%) | | 1 (100%) | 1 (100%) |
| **Amikacin** | 6 (60%) | 5 (83.33%) | 0 (0.00%) | 0 (0.00%) |
| **Aztreonam** | | 5 (83.33%) | | |
| **Azithromycin** | 8 (80%) | | | |
| **Meropenem** | 5 (50%) | 4 (66.66%) | 0 (0.00%) | 0 (0.00%) |
| **Netilmicin** | | 4 (83.33%) | | |
| **Cefepime** | | 1 (16.66%) | | |
| **Piperacillin-tazobactam** | 5 (50%) | 1 (16.66%) | 0 (0.00%) | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in central venous catheter samples

18 of 141 central venous catheter tips (12.8%) were culture positive, with *Klebsiella spp.* (10; 55.5%) and *Pseudomonas spp.* (6; 33.3%) predominating.

*Klebsiella spp.* exhibited high resistance to ceftriaxone, cefotaxime and amoxicillin-clavulanate (90% each), ciprofloxacin (80%) and gentamicin (70%), with meropenem and piperacillin-tazobactam resistance of 50%. *Pseudomonas spp.* showed resistance to amikacin, aztreonam and netilmicin (83.3% each) and to meropenem (66.7%), but lower resistance to ciprofloxacin, cefepime and piperacillin-tazobactam (16.7% each). The single *E. coli* and Acinetobacter isolates were susceptible to amikacin, meropenem, piperacillin-tazobactam and colistin. Colistin resistance was not observed.

## Sample: Urinary Catheter Tip
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **1,063** |
| Total culture positive | **52** |
| Rate of isolation of bacteria | **4.89%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 18 | 34.62% |
| *Pseudomonas* spp. | 15 | 28.85% |
| *Acinetobacter* spp. | 10 | 19.23% |
| *E. coli* | 7 | 13.46% |
| *Staphylococcus aureus* | 1 | 1.92% |
| *Proteus* spp. | 1 | 1.92% |

## Antimicrobial resistance patterns of bacterial isolates in Urinary Catheter Tip

| Antimicrobials | *Pseudomonas* spp. (n=15) | *Klebsiella* spp. (n=18) | *E. coli* (n=7) | *Acinetobacter* spp. (n=10) | *S. aureus* (n=1) | *Proteus* spp. (n=1) |
|---|---|---|---|---|---|---|
| **Amoxicillin** | | 16 (88.88%) | 7 (100%) | | 1 (100%) | 0 (0.00%) |
| **Cloxacillin** | | | | | 0 (0.00%) | |
| **Erythromycin** | | | | | 0 (0.00%) | |
| **Cotrimoxazole** | | 15 (83.33%) | 7 (100%) | 4 (40%) | 0 (0.00%) | 1 (50%) |
| **Ciprofloxacin** | 12 (80%) | 15 (83.33%) | 7 (100%) | 5 (50%) | 0 (0.00%) | 0 (0.00%) |
| **Ceftriaxone** | 12 (80%) | 14 (77.77%) | 6 (85.71%) | 10 (100%) | | 0 (0.00%) |
| **Gentamicin** | 12 (80%) | 13 (72.22%) | 6 (85.71%) | 7 (70%) | 0 (0.00%) | 1 (50%) |
| **Amoxicillin-clavulanate** | | 14 (77.77%) | 7 (100%) | | | 0 (0.00%) |
| **Cefotaxime** | | 16 (88.88%) | 7 (100%) | 8 (80%) | | 0 (0.00%) |
| **Ceftazidime** | 11 (73.33%) | 0 (0.00%) | | 9 (90%) | | 0 (0.00%) |
| **Cefuroxime** | | 17 (94.44%) | 7 (100%) | 9 (90%) | | 0 (0.00%) |
| **Amikacin** | 13 (86.66%) | 13 (72.22%) | 7 (100%) | 7 (70%) | | 1 (50%) |
| **Aztreonam** | 13 (86.66%) | | | | | 0 (0.00%) |
| **Azithromycin** | | 16 (88.88%) | 7 (100%) | | | 0 (0.00%) |
| **Meropenem** | 11 (73.33%) | 12 (66.66%) | 3 (42.85%) | 7 (70%) | | 0 (0.00%) |
| **Netilmicin** | 11 (73.33%) | | | | | |
| **Cefepime** | | | | 6 (60%) | | |
| **Piperacillin-tazobactam** | 10 (66.66%) | 9 (50%) | 4 (57.14%) | 6 (60%) | | 0 (0.00%) |
| **Colistin** | 1 (6.66%) | 0 (0.00%) | 1 (14.28%) | 0 (0.00%) | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in urinary catheter tip samples

Urinary catheter tips are reported separately for the first time this year. 52 of 1,063 samples (4.9%) were culture positive: *Klebsiella spp*. (18; 34.6%), *Pseudomonas spp.* (15; 28.9%), *Acinetobacter spp.* (10; 19.2%) and *E. coli* (7; 13.5%).

*Klebsiella spp.* showed high resistance to ciprofloxacin (83.3%) and meropenem (66.7%). *Pseudomonas spp.* was resistant to amikacin and aztreonam (86.7% each), ciprofloxacin and gentamicin (80% each) and meropenem (73.3%). *Acinetobacter spp.* was resistant to ceftriaxone in all isolates and to meropenem in 70%, while *E. coli* showed meropenem resistance of 42.9%. Colistin resistance in one Pseudomonas and one *E. coli* isolate needs BMD confirmation.

## Sample: Stent
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **24** |
| Total culture positive | **17** |
| Rate of isolation of bacteria | **70.83%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 8 | 47.06% |
| *E. coli* | 6 | 35.29% |
| *Pseudomonas* spp. | 3 | 17.65% |
| *Acinetobacter* spp. | 0 | 0.00% |
| *Staphylococcus aureus* | 0 | 0.00% |

## Antimicrobial resistance patterns of bacterial isolates in Stent

| Antimicrobials | *Klebsiella* spp. (n=8) | *E. coli* (n=6) | *Pseudomonas* spp. (n=3) | *Acinetobacter* spp. (n=0) | *S. aureus* (n=0) |
|---|---|---|---|---|---|
| **Amoxicillin** | 6 (75%) | 6 (100%) | | | 0 (0.00%) |
| **Cloxacillin** | | | | | 0 (0.00%) |
| **Erythromycin** | | | | | 0 (0.00%) |
| **Cephradine** | | | | | 0 (0.00%) |
| **Cotrimoxazole** | 8 (100%) | 5 (83.33%) | | 0 (0.00%) | 0 (0.00%) |
| **Ciprofloxacin** | 8 (100%) | 6 (100%) | 3 (100%) | 0 (0.00%) | 0 (0.00%) |
| **Ceftriaxone** | 8 (100%) | 6 (100%) | 0 (0.00%) | 0 (0.00%) | |
| **Gentamicin** | 8 (100%) | 2 (33.33%) | 2 (66.66%) | 0 (0.00%) | 0 (0.00%) |
| **Amoxicillin-clavulanate** | 8 (100%) | 6 (100%) | | | |
| **Cefotaxime** | 8 (100%) | 6 (100%) | | 0 (0.00%) | |
| **Ceftazidime** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | |
| **Cefuroxime** | 8 (100%) | 6 (100%) | | 0 (0.00%) | |
| **Amikacin** | 7 (87.5%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | |
| **Azithromycin** | 3 (37.5%) | 6 (100%) | | | |
| **Meropenem** | 6 (75%) | 4 (66.66%) | 1 (33.33%) | 0 (0.00%) | |
| **Piperacillin-tazobactam** | 1 (12.5%) | 3 (50%) | 0 (0.00%) | 0 (0.00%) | |
| **Colistin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | |
| **Cefoxitin** | | | | | 0 (0.00%) |
| **Vancomycin** | | | | | 0 (0.00%) |
| **Linezolid** | | | | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in stent samples

Stents are reported separately for the first time this year. 17 of 24 stent samples (70.8%) were culture positive: *Klebsiella spp*. (8; 47.1%), *E. coli* (6; 35.3%) and *Pseudomonas spp.* (3; 17.6%).

*Klebsiella spp.* was resistant to cotrimoxazole, ciprofloxacin, ceftriaxone, gentamicin, cefotaxime and cefuroxime in all isolates, with meropenem resistance of 75% and piperacillin-tazobactam resistance of 12.5%. *E. coli* was resistant to ciprofloxacin and third-generation cephalosporins in all isolates and to meropenem in 66.7%, but susceptible to amikacin. *Pseudomonas spp.* was resistant to ciprofloxacin in all isolates. No colistin resistance was detected.

## Sample: Urethral Discharge
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **323** |
| Total culture positive | **4** |
| Rate of isolation of bacteria | **1.24%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *Klebsiella* spp. | 3 | 75.00% |
| *E. coli* | 1 | 25.00% |

## Antimicrobial resistance patterns of bacterial isolates in Urethral Discharge

| Antimicrobials | *E. coli* (n=1) | *Klebsiella* spp. (n=3) |
|---|---|---|
| **Amoxicillin** | 1 (100%) | 3 (100%) |
| **Cotrimoxazole** | 1 (100%) | 0 (0.00%) |
| **Ciprofloxacin** | 1 (100%) | 1 (33.33%) |
| **Ceftriaxone** | 1 (100%) | 1 (33.33%) |
| **Gentamicin** | 1 (100%) | 0 (0.00%) |
| **Amoxicillin-clavulanate** | 1 (100%) | 2 (66.66%) |
| **Cefotaxime** | 1 (100%) | 1 (33.33%) |
| **Cefuroxime** | 1 (100%) | 1 (33.33%) |
| **Amikacin** | 1 (100%) | 0 (0.00%) |
| **Azithromycin** | 1 (100%) | 1 (33.33%) |
| **Meropenem** | 1 (100%) | 0 (0.00%) |
| **Piperacillin-tazobactam** | 1 (100%) | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

# Important findings in urethral discharge samples

Only 4 of 323 urethral discharge samples (1.2%) were culture positive: *Klebsiella spp. (3)* and *E. coli (1)*.

The single *E. coli* isolate was resistant to all antimicrobials tested, including meropenem and piperacillin-tazobactam, except colistin. *Klebsiella spp.* was resistant to amoxicillin in all isolates and to amoxicillin-clavulanate in 66.7%, but remained susceptible to cotrimoxazole, gentamicin, amikacin, meropenem, piperacillin-tazobactam and colistin.

## Sample: Synovial Fluid
### July 25 - June 26

| | |
|---|---|
| Total number of samples | **210** |
| Total culture positive | **6** |
| Rate of isolation of bacteria | **2.86%** |

**Organisms isolated:**

| Organism | No of isolates | Percentage |
|---|---|---|
| *E. coli* | 3 | 50.00% |
| *Klebsiella* spp. | 2 | 33.33% |
| *Staphylococcus aureus* | 1 | 16.67% |

## Antimicrobial resistance patterns of bacterial isolates in Synovial Fluid

| Antimicrobials | *Klebsiella* spp. (n=2) | *S. aureus* (n=1) | *E. coli* (n=3) |
|---|---|---|---|
| **Amoxicillin** | 1 (50%) | 0 (0.00%) | 3 (100%) |
| **Cloxacillin** | | 1 (50%) | |
| **Erythromycin** | | 1 (50%) | |
| **Cephradine** | | 1 (50%) | |
| **Cotrimoxazole** | 1 (50%) | 0 (0.00%) | 0 (0.00%) |
| **Ciprofloxacin** | 1 (50%) | 1 (50%) | 1 (33.33%) |
| **Ceftriaxone** | 1 (50%) | | 2 (66.66%) |
| **Gentamicin** | 1 (50%) | 1 (50%) | 3 (100%) |
| **Amoxicillin-clavulanate** | 1 (50%) | | 3 (100%) |
| **Cefotaxime** | 1 (50%) | | 2 (66.66%) |
| **Cefuroxime** | 2 (100%) | | 3 (100%) |
| **Amikacin** | 0 (0.00%) | | 3 (100%) |
| **Azithromycin** | 2 (100%) | | 2 (66.66%) |
| **Meropenem** | 0 (0.00%) | | 0 (0.00%) |
| **Piperacillin-tazobactam** | 0 (0.00%) | | 0 (0.00%) |
| **Colistin** | 0 (0.00%) | | 0 (0.00%) |

*Values are number (%) of resistant isolates; blank = not tested.*

## Important findings in synovial fluid samples

6 of 210 synovial fluid samples (2.9%) were culture positive: *E. coli (3)*, *Klebsiella spp. (2)* and *S. aureus (1)*.

*E. coli* was resistant to amoxicillin, gentamicin, amoxicillin-clavulanate, cefuroxime and amikacin in all isolates and to ceftriaxone in 66.7%, but susceptible to cotrimoxazole, meropenem, piperacillin-tazobactam and colistin. *Klebsiella spp.* showed resistance to cefuroxime and azithromycin, with no resistance to amikacin, meropenem, piperacillin-tazobactam or colistin.

# AMR Trends (2022 to 2026)

AMR data have been analyzed over the last five years from 2022 to 2026. MRSA (cefoxitin-resistant *S. aureus*) isolated from pus, wound, nasal and aural swabs increased from 9.7% in 2022-23 and 19.2% in 2024-25 to 26.3% (130 of 494 isolates) in 2025-26. Across all specimen types, 257 of 1,133 *S. aureus* isolates tested against cefoxitin (22.7%) were MRSA. Vancomycin resistance was reported for the first time, in 12 urinary *S. aureus* and 13 urinary *Enterococcus* isolates; no VRSA or VRE was detected in any other specimen. These isolates are awaiting confirmation by MIC and molecular methods.

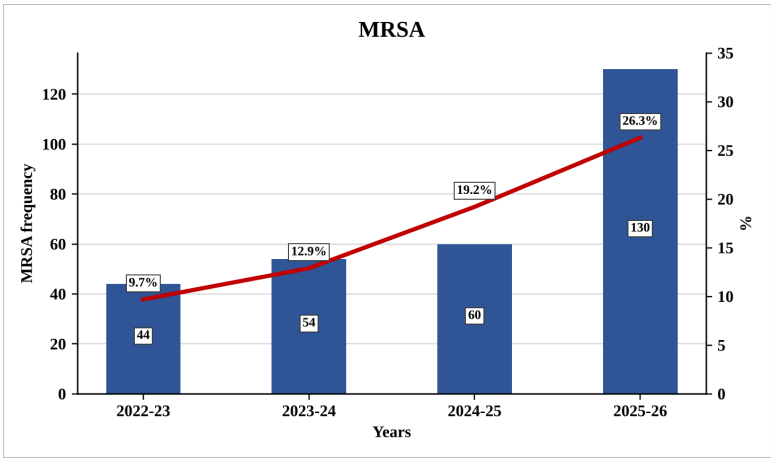



*Figure 11: Trends of Methicillin-resistant S. aureus (MRSA) isolated from different clinical isolates (2022-2026)*

Trend analysis for ESBL-producing *E. coli* from urine showed a further decrease, from 194 (3.16%) in 2025 to 176 (2.7%) in 2026.

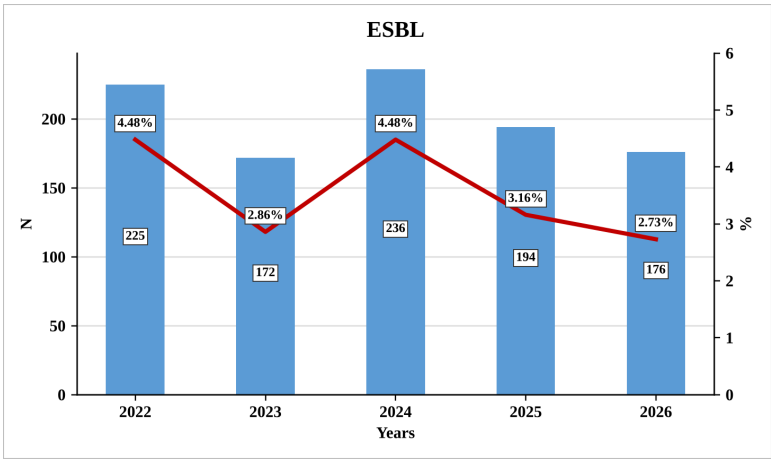



*Figure 12: Trends of Extended spectrum beta-lactamase (ESBL) producing E. coli isolated from urine (2022-2026)*

Moreover, the five-year trend analysis of carbapenem resistance shows a consistent increase. In 2025-26, 3,810 of 10,536 isolates of *E. coli, Klebsiella spp., Proteus spp., Enterobacter spp., Pseudomonas*

*spp.* and *Acinetobacter spp.* (36.2%) were meropenem resistant, compared with 28.2% in 2024-25. (For 2025-26, carbapenem resistance was calculated as the proportion of meropenem-resistant isolates among all isolates of each organism across all specimen types.)

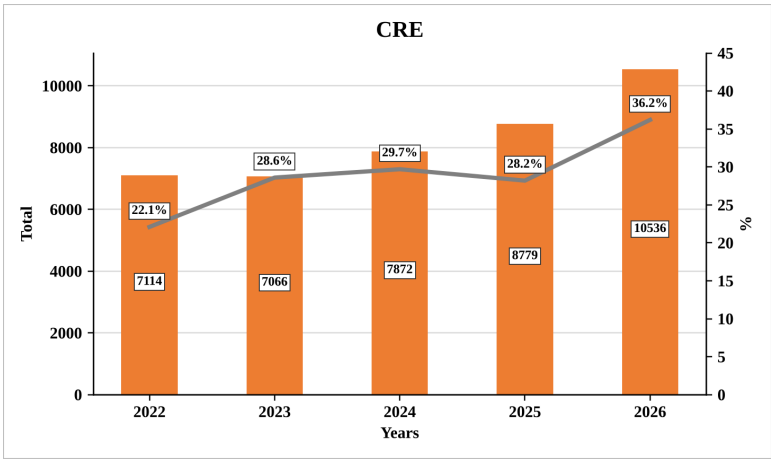



*Figure 13: Five-year trend analysis (2022-2026) of carbapenem-resistant Gram-negative bacilli*

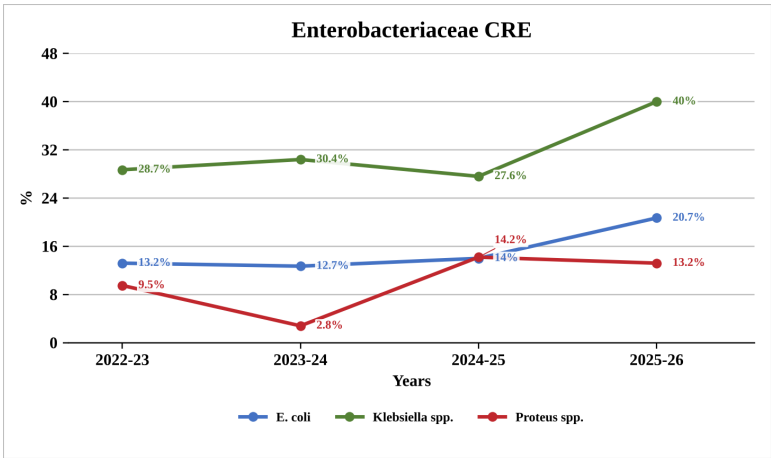



*Figure 14: Four-year trend analysis (2022-23 to 2025-26) of carbapenem-resistant Enterobacterales*

The line graph illustrates the trends in carbapenem resistance of Enterobacterales, specifically *E. coli, Klebsiella spp.* and *Proteus spp. Klebsiella spp.* remained the most frequent carbapenem-resistant organism, with resistance rising sharply from 27.6% in 2024-25 to 40% in 2025-26. *E. coli* showed a similar increase, from 14% to 20.7%, while *Proteus spp.* remained stable (13.2% vs. 14.2%).

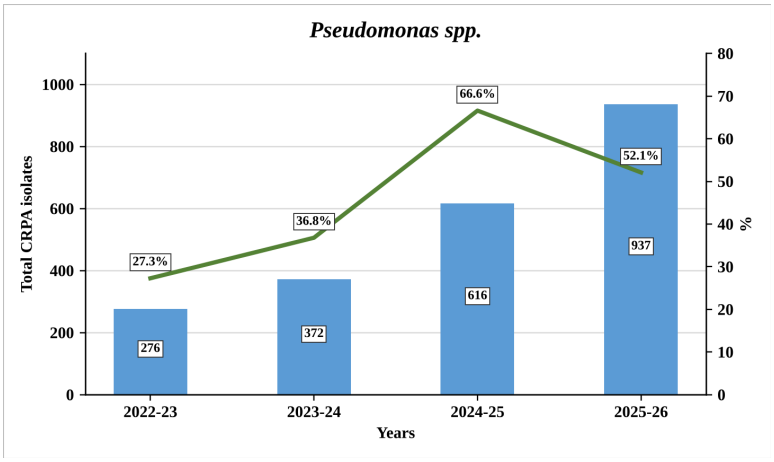



*Figure 15: Four-year trend analysis (2022-23 to 2025-26) of carbapenem-resistant Pseudomonas spp.*

The number of carbapenem-resistant Pseudomonas (CRPA) isolates continued to rise each year, from 276 in 2022-23 to 616 in 2024-25 and 937 in 2025-26. The proportion of resistant isolates was 52.1% this year, lower than the 66.6% reported in 2024-25 but almost double the 27.3% of 2022-23, signaling persistently high carbapenem resistance in *Pseudomonas spp.*

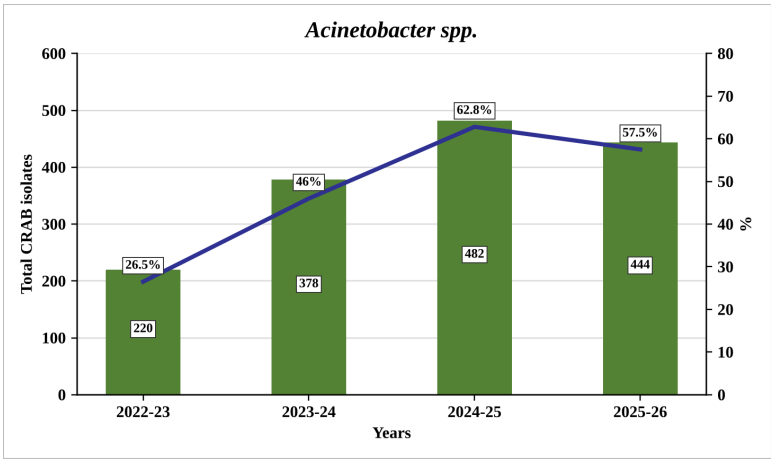



*Figure 16: Four-year trend analysis (2022-23 to 2025-26) of carbapenem-resistant Acinetobacter spp.*

Carbapenem-resistant Acinetobacter (CRAB) accounted for 444 isolates (57.5%) in 2025-26, compared with 482 (62.8%) in 2024-25 and 220 (26.5%) in 2022-23. Although the proportion fell slightly this year, more than half of all Acinetobacter isolates remain carbapenem resistant, and resistance exceeded 90% in isolates from tracheal aspirates and throat swabs.

# Candida species from bloodstream infections

A total of 6,591 blood samples were processed for fungal culture in the automated system, of which 76 (1.1%) yielded yeasts. The most common species were Candida albicans and Candida tropicalis (22 isolates each, 28.95%), followed by Candida ciferrii (18; 23.7%), Candida parapsilosis (8; 10.5%) and Candida pelliculosa (2; 2.6%). Non-albicans Candida (NAC) species accounted for 50 of the 72 Candida isolates (69.4%), highlighting the continuing epidemiological shift from C. albicans. Other yeasts (4 isolates) included Cryptococcus laurentii and Kodamaea ohmeri.

**Table: Fungal species detected in blood samples (automated system), July 2025 – June 2026**

| Fungal species | Frequency | Percentage |
|---|---|---|
| *Candida albicans* | 22 | 28.95% |
| *Candida tropicalis* | 22 | 28.95% |
| *Candida ciferrii* | 18 | 23.68% |
| *Candida parapsilosis* | 8 | 10.53% |
| *Candida pelliculosa* | 2 | 2.63% |
| Others (*Cryptococcus laurentii, Kodamaea ohmeri*) | 4 | 5.26% |
| **Total** | **76** | **100%** |

**Table: Antifungal resistance pattern of *Candida* species isolated from blood**

| Antifungal agents | *C. albicans* (n=22) | *C. tropicalis* (n=22) | *C. ciferrii* (n=18) | *C. parapsilosis* (n=8) | *C. pelliculosa* (n=2) |
|---|---|---|---|---|---|
| **Fluconazole** | 7 (31.81%) | 4 (18.18%) | 13 (72.23%) | 3 (37.50%) | 0 (0.00%) |
| **Voriconazole** | 2 (9.09%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |
| **Amphotericin B** | 2 (9.09%) | 0 (0.00%) | 10 (55.56%) | 0 (0.00%) | 0 (0.00%) |
| **Caspofungin** | 2 (9.09%) | 0 (0.00%) | 10 (55.56%) | 0 (0.00%) | 0 (0.00%) |
| **Micafungin** | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) |

Fluconazole shows varying resistance levels, with the highest resistance in *Candida ciferrii* (72.2%; 40% in 2024-25), followed by *C. parapsilosis* (37.5%), *C. albicans* (31.8%) and *C. tropicalis* (18.2%), while both *C. pelliculosa* isolates were susceptible. Voriconazole demonstrated high efficacy, with resistance only in *C. albicans* (9.1%).

Amphotericin B and caspofungin resistance was observed mainly in *C. ciferrii* (55.6% each) and in *C. albicans* (9.1% each), whereas micafungin showed no resistance in any species, making it the most reliable agent in this dataset. Because caspofungin MIC testing is known to show inter-laboratory variability, isolates that appear caspofungin resistant but micafungin susceptible should be confirmed (e.g. by testing another echinocandin or by *FKS* gene analysis). The marked increase of *C. ciferrii*, with high resistance to fluconazole and amphotericin B, warrants confirmation of species identification (e.g. by MALDI-TOF MS or sequencing) and careful species-directed treatment.

# Summary Highlights

- Rising carbapenem resistance, especially in *Klebsiella* spp. (40%) and *E. coli* (20.7%); more than 95% in ICU respiratory isolates.
- MRSA on the rise (26.3% in pus, wound, nasal and aural isolates).
- Vancomycin-resistant *S. aureus* and *Enterococcus* from urine.
- Last-resort antibiotics like colistin remain largely effective, but resistance is detected in blood isolates of *Klebsiella* and *Acinetobacter*.
- Fluoroquinolone resistance in *Salmonella* Typhi increased again (50%) and ceftriaxone-resistant *S.* Typhi persists.
- *Candida ciferrii* is emerging in blood with high fluconazole resistance; micafungin remains universally active.

# Summary

This annual report on AMR data at Bangladesh Medical University (BMU) presents data from 50,844 clinical specimens, of which 13,252 (26.1%) were culture positive. Urine specimens accounted for the majority of isolates (48.6%), followed by wound swabs (16.1%) and blood (10.2%). *Escherichia coli* was the most common pathogen in urine (50.6%), while *Klebsiella* spp. was predominant in blood (18.6%), followed by *S. aureus* and *Salmonella* Typhi. Among Gram-positive bacteria, *S. aureus* was predominant in pus and wound swabs, while *Enterococcus* was prevalent in urine. *Klebsiella* spp. in sputum samples has shown a rising trend (91.6%).

*Salmonella enterica* serovar Typhi, with 142 isolates, demonstrated ciprofloxacin resistance of 50%, while chloramphenicol and cotrimoxazole showed lower resistance (14.9% and 12%, respectively). Notably, 5 isolates were resistant to ceftriaxone, an issue warranting sequencing to investigate clonality. Linezolid resistance remained absent in blood isolates but was detected in urinary (2.5%), pus (0.9%) and wound (0.4%) *S. aureus*. Vancomycin resistance in *S. aureus* and *Enterococcus* was reported from urine.

*E. coli* in urine exhibited a rise in resistance to ciprofloxacin (75.5%), amoxicillin (82.8%) and nitrofurantoin (50.1%), whereas piperacillin-tazobactam (9.4%), colistin and tigecycline (0%) remained effective; meropenem resistance increased to 18.4%. *Klebsiella* spp. displayed resistance to ciprofloxacin (56.8%), gentamicin (60.9%) and ceftriaxone (55.9%), with colistin and tigecycline still effective.

*Acinetobacter* spp., often linked to hospital-acquired infections, showed high resistance to ciprofloxacin, gentamicin and cephalosporins across specimens, with meropenem resistance ranging from 31.9% in urine to 95.5% in tracheal aspirates. Resistance of *Klebsiella* spp., *Pseudomonas* spp. and *Acinetobacter* spp. to ciprofloxacin and gentamicin was significant in wound swab and pus samples.

Analysis of AMR trend data from 2022 to 2026 shows mixed trends. MRSA prevalence has increased from 9.7% in 2022-23 to 26.3% in 2025-26. The proportion of ESBL-producing *E. coli* from urine decreased from 4.48% in 2022 to 2.7% in 2026. Conversely, carbapenem-resistant *E. coli*, *Klebsiella* spp. and Gram-negative bacilli overall have shown consistent increases, and carbapenem resistance in *Pseudomonas* spp. and *Acinetobacter* spp. remains above 50%.

*Candida albicans* and *Candida tropicalis* were the most frequently isolated *Candida* species in invasive candidemia, with a notable rise of *C. ciferrii*. The antifungal susceptibility patterns revealed fluconazole resistance in several species, most notably *C. ciferrii* (72.2%), *C. parapsilosis* (37.5%), *C. albicans* (31.8%) and *C. tropicalis* (18.2%), whereas micafungin resistance was not detected.

Data quality assurance has been ensured through regular laboratory and data management training, monthly monitoring, feedback and review meetings. The EQAS programme and stringent internal quality controls (media and antibiotic disc standards per CLSI recommendations) were key to improving data integrity. However, the current report, as in previous years, highlights limitations in hospital and demographic data collection and laboratory integration, which may skew AMR trends. There is a clear need for expanded surveillance to ensure more accurate trend analysis.

# Recommendations

This report emphasizes the need for improved surveillance, monitoring and strategic interventions to combat the rising AMR threat. Key actions include:

- These antibiogram data can be used for formulating institutional antibiotic policy accordingly.
- Expanding surveillance to accurately track AMR trends.
- Strengthening antimicrobial stewardship programme, infection control, improving laboratory systems, ensuring responsible antimicrobial use in human and animal health and developing national action plans.
- Focusing research on bacterial and fungal pathogens, including drug-resistant tuberculosis, to address AMR by 2030, with priorities covering prevention, diagnosis, treatment and knowledge gaps in AMR epidemiology, policies and education.
- Confirming all vancomycin-, linezolid- and colistin-resistant isolates by molecular testing.
- Prioritizing carbapenem-sparing stewardship and strict infection-control bundles in ICUs, where carbapenem resistance in respiratory isolates now exceeds 90%.

# Appendix: Intrinsic Resistance

**Intrinsic Resistance (IR): IR is defined as inherent or innate (not acquired) autimicrobial resistance, which is reflected in wild-type antimicrobial patterns of all or almost all representatives of a species.**

## A. Enterobacterales

| Antimicrobial agents → / Organism ↓ | Ampicillin | Amoxicillin-clavulanate | Ampicillin-sulbactam | Ticarcillin | Cephalosporins I (Cefazolin, Cephalothin) | Cephamycins (Cefoxitin, Cefotetan) | Cephalosporins II (Cefuroxime) | Imipenem | Tetracyclines | Tigecycline | Nitrofurantoin | Polymyxin B | Colistin | Aminoglycosides |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Citrobacter freundii*** | R | R | R | | R | R | R | | | | | | | |
| ***Citrobacter koseri / C. amalonaticus* group** | R | | | | R | R | | | | | | | | |
| ***Enterobacter cloacae* complex** | R | R | R | | R | R | | | | | | | | |
| ***Escherichia coli*** | *No intrinsic resistance to β-lactams* | | | | | | | | | | | | | |
| ***Escherichia hermannii*** | R | | | R | | | | | | | | | | |
| ***Klebsiella* (formerly *Enterobacter*) *aerogenes*** | R | R | R | | R | R | | | | | | | | |
| ***Klebsiella pneumoniae / K. oxytoca / K. variicola*** | R | | | R | | | | | | | | | | |
| ***Morganella morganii*** | R | R | | | R | | R | | | R | R | R | R | |
| ***Proteus mirabilis*** | *No intrinsic resistance to penicillins and cephalosporins* | | | | | | | | R | R | R | R | R | |
| ***Proteus penneri*** | R | | | | R | | R | | R | R | R | R | R | |
| ***Proteus vulgaris*** | R | | | | R | | R | | R | R | R | R | R | |
| ***Providencia rettgeri*** | R | R | | | R | | | | R | R | R | R | R | |
| ***Providencia stuartii*** | R | R | | | R | | | | R | R | R | R | R | |
| ***Raoultella* spp** | R | | | R | | | | | | | | | | |
| ***Salmonella and Shigella* spp.** | *No intrinsic resistance to β-lactams* | | | | | | | | | | | | | |
| ***Serratia marcescens*** | R | R | R | | R | R | R | | | | R | R | R | |
| ***Yertsinia enterocolitica*** | R | R | | R | R | | | | | | | | | |

*R: Resistant; CLSI. M100 performance standards for Antimicrobial Susceptibility Testing, 34th Ed. CLSIGuideline M100, Clinical and laboratory Standards Institute; 2024*

## B. Non-Enterobacterales

| Antimicrobial agents → / Organism ↓ | Ampicillin, Amoxicillin | Piperacillin | Ticarcillin | Ampicillin–sulbactam | Amoxicillin–clavulanate | Piperacillin–tazobactam | Cefotaxime | Ceftriaxone | Ceftazidime | Cefepime | Aztreonam | Imipenem | Meropenem | Ertapenem | Polymyxin B Colistin | Aminoglycosides | Tetracyclines, Tigecycline | Trimethoprim | Trimethoprim–sulfamethoxazole | Chloramphenicol | Fosfomycin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Acinetobacter baumannii / A. calcoaceticus* complex** | R | | | | R | | | | | | R | | | R | | | | R | | R | R |
| ***Burkholderia cepacia* complex** | R | R | R | R | R | | | | | | | | | R | R | | | | | | R |
| ***Pseudomonas aeruginosa*** | R | | | R | R | | R | R | | | | | | R | | | R | | R | R | |
| ***Stenotrophomonas maltophilia*** | R | R | R | R | R | R | R | R | | | R | R | R | R | | R | | R | | | R |

*R: Resistant; CLSI. M100 performance standards for Antimicrobial Susceptibility Testing, 34th Ed. CLSIGuideline M100, Clinical and laboratory Standards Institute; 2024*

## C. Staphylococcus spp.

| Antimicrobial agents → / Organism ↓ | Novobiocin | Fosfomycin | Fusidic acid |
|---|---|---|---|
| ***S. aureus*** <br> ***S. lugdunensis*** | *There is no intrinsic resistance in these species* | | |
| ***S. epidermidis*** | | | |
| ***S. haemolyticus*** | | | |
| ***S. saprophyticus*** | R | R | R |
| ***S. capitis*** | | R | |
| ***S. cohnii*** | R | | |
| ***S. xylosus*** | R | | |

## D. Enterococcus spp.

| Antimicrobial agents → / Organism ↓ | Cephalosporins | Vancomycin | Teicoplanin | Aminoglycosides | Clindamycin | Quinupristin–dalfopristin | Trimethoprim | Trimethoprim–sulfamethoxazole | Fusidic acid |
|---|---|---|---|---|---|---|---|---|---|
| ***E. faecalis*** | R[a] | | | R[a] | R[a] | R | R | R[a] | R |
| ***E. faecium*** | R[a] | | | R[a] | R[a] | | R | R[a] | R |
| ***E. gallinarum / E. casseliflavus*** | R[a] | R | | R[a] | R[a] | R | R | R[a] | R |

*R: Resistant; CLSI. M100 performance standards for Antimicrobial Susceptibility Testing, 34th Ed. CLSIGuideline M100, Clinical and laboratory Standards Institute; 2024*

[a]For *Enterococcus* spp., cephalosporins, aminoglycosides (except for high-level resistance testing), clindamycin and trimethoprim-sulfamethoxazole may appear active in vitro but are not effective clinically and should not be reported as susceptible.

# Bangladesh Medical University

Department of Microbiology & Immunology

## Test Examination

| | Name of the examination | | Name of the examination | | Name of the examination | | Name of the examination |
|---|---|---|---|---|---|---|---|
| 1 | **HORMONES** | 40 | **ENA Profile** | 79 | TPHA (Q+Q) | 118 | HLA-DOB1genotyping |
| 2 | Prolactin | 41 | Anti Sm/RNP/Anti Rib/Jo1 | 80 | Widal Test | 119 | HLA-B27 DNA |
| 3 | Testosterone | 42 | SSA/SSB/ScL 70 | 81 | Febrile Antigen | 120 | T-cell, B-cell cross matching |
| 4 | FSH | 43 | Anti Centromere Ab | 82 | Pro Calcitonin (PCT) | 121 | **TEST FOR LEUKEMIA** |
| 5 | LH | 44 | ASO/RA/CRP(Quantitative) | 83 | **CULTURE** | 122 | Immunophenotyping for Acute leukemia |
| 6 | Estrogen | 45 | IgG/IgM/IgA (Quantitative) | 84 | Automated Blood Culture with MIC | 123 | Immunophenotyping for PNH clone (PBC/WBC) |
| 7 | Progesterone | 46 | C3/C4 (Quantitative) | 85 | Conventional Blood Culture | 124 | Stem cell enumeration |
| 8 | Testosterone (Free) | 47 | IgE (Quantitative) | 86 | Urine/Throat Swab / Wound Swab | 125 | BCR-ABL (Major) Quantitative for CML |
| 9 | Growth Hormone | 48 | Rose Waaler | 87 | Fungus | 126 | BCR-ABL screening (Major/ Minor/Micro) |
| 10 | Cortisol | 49 | Hs CRP | 88 | Stool/Mycobacteria / Leishmania | 127 | BCR-ABL Quantitative for CML followup |
| 11 | Ant Mulierian hormone (AMH) | 50 | Anti-CCP | 89 | P/S U/SHVS | 128 | PML-RARA1 (15-17) translocation |
| 12 | β-hCG | 51 | Tissue Transglutaminase IgA (ITg-A) | 90 | Sputum/Pus/ Pleural Fluid | 129 | JAK2 V617F mutation |
| 13 | ACTH | 52 | Anti Acetylcholine Receptor Ab | 91 | STAINING: M/E | 130 | CALR/MPL/FLT3-ITD/ InV16/1(8:21) |
| 14 | I-PTH | 53 | IL-6 | 92 | Gram's/AFB/KLB Stain/ Fungus M/E | 131 | **TEST FOR IMMUNODEFICIENCY** |
| 15 | Calcitonin | 54 | SFerritin | 93 | LD Body / Microfilaria / MP | 132 | Primary immunodeficiency (PID) |
| 16 | Renin | 55 | **AUTO IMMUNE HEPATITIS PANEL** | 94 | DGI for Leptospira (Urine) | 133 | Nitroblue Tetrazolium Test (NBT) |
| 17 | Aldosterone | 56 | Anti LKM-1 | 95 | Slit Skin Smear for AFB | 134 | Dihydrorhodamine test (DHR) 123 Test |
| 18 | 17-OH-PROGESTRONE/ DHEA-S | 57 | Anti Smooth Muscle Ab | 96 | Microscopy of hydatid cyst from fluid | 135 | CD19 B cell count |
| 19 | SHBG | 58 | Auto Immune Liver Diseases Panel | 97 | **OTHERS** | 136 | CD4 T lymphocyte count |
| 20 | **THYROID PANEL** | 59 | Anti Mitochondrial Ab | 98 | Automated Semen Analysis | 137 | CD4:CD8 ratio |
| 21 | T3 | 60 | **TUMOUR MARKERS** | 99 | Semen Analysis | 138 | **PANEL TEST** |
| 22 | T4 | 61 | PSA | 100 | Tuberculin Skin Test (MT) | 139 | Sepsis Panel |
| 23 | TSH | 62 | CEA | 101 | Pregnancy Test | 140 | Meningitis Panel (Combined) |
| 24 | T3, T4, TSH | 63 | AFP | 102 | MOLECULAR DIAGNOSTICS | 141 | Bacterial Meningitis Panel |
| 25 | FT3 | 64 | CA-125 | 103 | MTB-NTM | 142 | Respiratory Bacterial Panel |
| 26 | FT4 | 65 | CA-153 | 104 | MTB-MDR | 143 | Tropical Fever Panel |
| 27 | FT3, FT4, TSH | 66 | CA-199 | 105 | GeneXpert MTB/RIF | 144 | STD Panel (Combined) |
| 28 | Anti thyroglobulin Ab (ATG) | 67 | SEROLOGY/OTHERS | 106 | IGRA | 145 | Colorectal Cancer full Panel |
| 29 | Anti thyroid Peroxidase Ab (TPO) | 68 | Echinococcus Ab (ELISA) | 107 | KRAS | 146 | **INFERTILITY PANEL** |
| 30 | Thyroglobulin | 69 | Fecal calprotectin | 108 | NRAS | 147 | Male (FSH,LH, Testosterone, TSH, Prolactin) |
| 31 | TSH Receptor Antibodies (TRAb) | 70 | ICT Filaria / Kalaazar / Malaria /TB | 109 | BRAF | 148 | Female (FSH, LH, TSH, AMH, Prolactin) |
| 32 | **Extended Thyroid Panel** (FT3 FT4, TSH, ArtTG, AntiTPO, TRAD) | 71 | ICT Leptospira / Salmonella Typhi IgM+IgG | 110 | PIK3CA | 149 | **FUNGAL IMMUNOASSY** |
| 33 | **AUTO IMMUNE PANEL** | 72 | ICT For Hpylori stool antigen | 111 | AKTI | 150 | Aspergillus GalactomannanAg |
| 34 | ANA by Immunofluorescence (Hep-2) | 73 | Anti TB IgG/IgM / IgA | 112 | EGFR Mutation | 151 | Aspergillus IgG Ab |
| 35 | Anti-ds DNA | 74 | Hpylori IgG | 113 | BRCA 1/2 | 152 | B-D glucan assay |
| 36 | PANCA | 75 | Adenosine deaminase (ADA) | 114 | HLA/Tissue Typing/ Cross-matching | 153 | **ALLERGY PANEL** |
| 37 | CANCA | 76 | RPR (VDRL) | 115 | HLA-ABDR genotyping | 154 | Food & Inhalation |
| 38 | Anti Cardiolipin Ab IgG/IgM | 77 | RPR (VDRL) (Q+Q) | 116 | HLA-DR genotyping | 155 | Food/Inhalation |
| 39 | Anti Phospholipid Ab IgG/ IgM | 78 | TPHA | 117 | HLA-C genotyping | | |




# WORLD AMR AWARENESS WEEK

**18–24 NOVEMBER 2026**

## One Health, One Action:

# Prevent AMR Now

Use antibiotics only as prescribed • Never share antibiotics

Organized by:

**Department of Microbiology & Immunology**
**Bangladesh Medical University (BMU)**




Department of Microbiology & Immunology

# Bangladesh Medical University