

Abu Dhabi Antimicrobial Resistance (AMR) Surveillance Report

Year **2024**





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Table of Contents

	Foreword	07
01	Executive Summary	08
02	Introduction	10
03	Methodology	13
	3.1 Data Generation	14
	3.1.1 AMR Surveillance System	14
	3.1.2 Surveillance Sites	14
	3.1.3 Surveillance Sites Selection	15
	3.1.4 Identification of Organisms	15
	3.1.5 Antimicrobial Susceptibility Testing (AST)	16
	3.1.6 Interpretation of Susceptibility Testing Results	16
	3.1.7 Clinical and Demographic Data	16
	3.1.8 Quality Control	17
	3.2 Data Collection	17
	3.2.1. Data Submission	18
	3.2.2. Data Cleaning	19
	3.3 Data Analysis Method	20
	3.3.1. Data Analysis	20
	3.3.2. Definitions Used	21
	3.3.3. Statistical Considerations	21
04	Results	22
	4.1 Patient/ Isolates characteristics	23
	4.1.1 Pathogen Distribution	23
	4.1.2 Age-group	23
	4.1.3 Gender	24
	4.1.4 Isolate Source	24
05	AMR Priority Pathogens	25
	5.1 <i>Escherichia coli</i>	26
	5.2 <i>Klebsiella pneumoniae</i>	28
	5.3 <i>Pseudomonas aeruginosa</i>	30
	5.4 <i>Salmonella spp. (Typhi and Non-typhi)</i>	31
	5.5 <i>Acinetobacter baumannii</i>	33
	5.6 <i>Staphylococcus aureus</i>	34
	5.7 <i>Streptococcus pneumoniae</i>	36
	5.8 <i>Enterococcus faecium</i>	37
	5.9 <i>Candida spp</i>	38
	5.10 <i>Mycobacterium tuberculosis</i>	39
06	Summary Overview of AMR Trends in the Emirate of Abu Dhabi (2010-2014) ...	40
	6.1 Gram-Negative Bacteria	41
	6.2 Gram-Positive Bacteria	41
07	Cumulative Antibigram	42
	7.1 Table: Gram-Negative Cumulative Antibigram for the Emirate of Abu Dhabi (2024)	44
	7.2 Table: Gram-Positive Cumulative Antibigram for the Emirate of Abu Dhabi (2024)	46
08	Summary and Recommendations	48
	Annexes	50
	Annex (1): Data Fields Collected for AMR Surveillance	50
	Annex (2): AMR Surveillance Sites in the Emirate of Abu Dhabi	51
	References	54

List of abbreviations

%I	Percent Intermediate
%MDR	Percent Multidrug-Resistant
%NS	Percent Non-Susceptible
%R	Percent Resistance
%S	Percent Susceptible
ADPHC	Abu Dhabi Public Health Centre
AMR	Antimicrobial Resistance
AST	Antimicrobial Susceptibility Test
CA	Community-Associated
CLSI	Clinical and Laboratory Standards Institute
DOH	Department of Health - Abu Dhabi
ECDC	European Centre for Disease Prevention and Control
EUCAST	European Committee for Antimicrobial Susceptibility Testing
ESBL	Extended Spectrum Beta-Lactamase
<i>E. coli</i>	<i>Escherichia coli</i>
<i>E. faecalis</i> / <i>E. faecium</i>	<i>Enterococcus faecalis</i> / <i>Enterococcus faecium</i>
GLASS	Global AMR Surveillance System (WHO)
HAAD	Health Authority Abu Dhabi
HAI	Healthcare-Associated Infections
HIS	Hospital Information System
ICU	Intensive Care Unit
<i>K. pneumoniae</i>	<i>Klebsiella pneumoniae</i>
LIS	Laboratory Information System
MDR	Multidrug Resistance
MIC	Minimal Inhibitory Concentration
MSSA	Methicillin- (oxacillin-) susceptible Staph. aureus
MRSA	Methicillin- (oxacillin-) resistant Staph. aureus
<i>M. tuberculosis</i>	<i>Mycobacterium tuberculosis</i>
<i>N. gonorrhoeae</i>	<i>Neisseria gonorrhoeae</i>
N	Number
NRL	National Reference Lab
<i>P. aeruginosa</i>	<i>Pseudomonas aeruginosa</i>
PHC	Primary Healthcare Center
PDR	Pandrug-resistant
RESP.	Respiratory
<i>S. aureus</i> or <i>Staph. aureus</i>	<i>Staphylococcus aureus</i>
<i>S. pneumoniae</i>	<i>Staphylococcus aureus</i>
SEHA	Abu Dhabi Health Services Company
<i>Spp.</i>	Species
UAE	United Arab Emirates
VRE	Vancomycin-Resistant <i>Enterococci</i>
WHO	World Health Organization
XDR	Extensively drug resistant

Foreword

Antimicrobial resistance (AMR) emerged as one of the most pressing global public health challenges of our time, threatening the effectiveness of antibiotics and putting countless lives at risk. Therefore, the need for proactive surveillance and monitoring of AMR cannot be overemphasized.

AMR surveillance serves as a vital tool in understanding the patterns, trends and impact of drug resistance within our communities and healthcare systems. It enables us to identify emerging resistant strains, track their spread and assess the effectiveness of our interventions. By gathering and analyzing this information, we gain valuable insight into strategies that will be needed to combat AMR effectively.

Effective AMR surveillance requires collaboration and coordination across multiple sectors. By fostering partnerships and sharing data, we can establish a robust surveillance network, enabling us to detect and respond to AMR rapidly. Through surveillance and analysis, we empower healthcare professionals to make informed decisions and optimize patient care while preserving the effectiveness of our precious antimicrobial resources.

The Ministry of Health and Prevention, UAE Higher Committee for AMR, Abu Dhabi AMR Committee and the AMR focal points in participating surveillance sites and laboratories have actively engaged in extensive efforts to promote awareness, enhance surveillance, and develop evidence-based strategies to combat AMR. The Abu Dhabi Surveillance Program is aligned with these collective efforts, ensuring that we contribute effectively to the national strategies against AMR.

We extend our heartfelt appreciation to our esteemed colleagues and dedicated focal points within the network of participating laboratories and surveillance sites, and the AMR experts, for their tireless efforts, unwavering support, and invaluable contributions to the AMR surveillance network. Their dedication has been beneficial in the successful completion of this report. AMR surveillance is a key support in our efforts against antimicrobial resistance. Together, we can safeguard the effectiveness of antibiotics, protect public health, and build a healthier and more resilient world.

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01

Executive Summary



The Abu Dhabi AMR surveillance report has been initiated to report and monitor the trend of antimicrobial resistance at the emirate level. Abu Dhabi AMR surveillance program was implemented in 2010 and is actively contributing to the UAE National AMR Surveillance System which has been established by the Ministry of Health and Prevention.

It is a lab-based surveillance system and currently relies on a network of 18 clinical microbiology laboratories across all regions of the emirate of Abu Dhabi, providing microbiology services for 146 surveillance sites (hospitals, centers, and clinics).

This report presents AMR data on 213,162 isolates from surveillance sites (public and private sector) for the year 2024. The report includes and compares the trends of priority pathogens over a five-year reporting period (2020-2024). Data for the reporting year 2024 is presented in the form of cumulative antibiograms, as well as more detailed statistics and annual trends for several AMR priority pathogens.

The report concludes by providing valuable recommendations for healthcare professionals on actions to combat AMR development.

02

Introduction

Antimicrobial resistance (AMR) remains a major threat to public health worldwide, including the Middle East and the Gulf Region. The impact of AMR on human health manifests in various ways, including prolonged hospital stays, treatment failures and loss of life. In addition, it increases the direct and indirect costs of healthcare.

Antimicrobial resistance (AMR) is the ability of a microorganism to resist the action of one or more antimicrobial medications. Without effective antimicrobials, the success of modern medicine in treating infections would be at an increased risk. Development of AMR is a natural phenomenon caused by mutations in bacterial genes, or by acquisition of exogenous resistance genes carried by mobile genetic elements that can spread horizontally between bacteria. Bacteria can acquire multiple resistance mechanisms and hence become resistant to numerous, or even all, antimicrobial agents used to treat them. This poses a significant challenge as it can greatly restrict the range of treatment options available for infections, while insufficient infection prevention and control measures facilitate the transmission of resistant pathogens.

According to World Health Organization (WHO), overuse and misuse of antimicrobials are the main drivers in the development of drug-resistant pathogens, and the transmission of antimicrobial-resistant microorganisms between humans, animals, and the environment. While antimicrobial use exerts ecological pressure on bacteria and contributes to the emergence and selection of new AMR.

Table 2.1 provides a summary overview of the current level of AMR in 2024 among relevant and priority pathogens in the emirate of Abu Dhabi (percent resistant isolates, %R).

In summary, the evidence presented in this report indicates a high and widespread presence of AMR. The overall resistance patterns observed in the Emirate of Abu Dhabi align with the trends observed at the national level, emphasizing the need for comprehensive strategies to address AMR effectively.



Table 2.1 Current levels of AMR among relevant and AMR priority pathogens in Abu Dhabi compared to national data, Percentage resistant isolates (%R), 2024

Priority ^a	Organism	Antibiotic/Antibiotic class	AD number of isolates (2024)	% Resistant isolates in AD (2024)
Priority 1: Critical	<i>Acinetobacter baumannii</i>	Carbapenems (MEM)	524	4.6
	<i>Enterobacterales</i> (all)	Carbapenems (MEM)	39,934	1.1
	<i>Escherichia coli</i>	Carbapenems (MEM)	22,915	0.7
	<i>Klebsiella pneumoniae</i>	Carbapenems (MEM)	9,331	1.9
	<i>Enterobacterales</i> (all)	Ceftriaxone/Cefotaxime (ESBL) ^b	25,457/16,593	29.5/26.8
	<i>Escherichia coli</i>	Ceftriaxone/Cefotaxime (ESBL) ^b	15,443/9,272	36/34.2
Priority 2: High	<i>Klebsiella pneumoniae</i>	Ceftriaxone/Cefotaxime (ESBL) ^b	5,991/4,203	23.2/21.6
	<i>Enterococcus faecium</i>	Vancomycin (VRE) ^c	275	16.4
	<i>Staphylococcus aureus</i>	Oxacillin (MRSA) ^d	10,576	38.6
	<i>Salmonella spp.</i> (non-typh.)	Fluoroquinolones (ciprofloxacin)	615	11.9
	<i>Salmonella spp.</i> (typhi)	Fluoroquinolones (ciprofloxacin)	213	48.3
	<i>Shigella spp.</i> ^e	Fluoroquinolones (ciprofloxacin)	37	29.6
	<i>Pseudomonas aeruginosa</i>	Carbapenems (MEM)	5,486	10.1
	<i>Neisseria gonorrhoeae</i>	3 rd -generation cephalosporins (Ceftriaxone)	142	0.0
Priority 3: Medium	<i>Neisseria gonorrhoeae</i>	Fluoroquinolones (ciprofloxacin)	141	80.1
	<i>Streptococcus pneumoniae</i>	Macrolide (Erythromycin)	1,440	58.3
	Group A <i>Streptococci</i>	Macrolide (Erythromycin)	2,013	44.7
	Group B <i>Streptococci</i>	Penicillin G	4,292	0.0
	<i>Haemophilus influenzae</i>	Ampicillin	722	27.7

^a Based on: (WHO, 2024).

^b ESBL: Extended-spectrum beta-lactamase producer (based on resistance to ceftriaxone and/or cefotaxime),

^c VRE: Vancomycin-resistant *Enterococcus faecium*,

^d MRSA: Methicillin (oxacillin)-resistant *S. aureus*.

^e Result to be interpreted with caution

03

Methodology

3.1. Data Generation

3.1.1. AMR Surveillance System

Public health surveillance is a continuous and systematic collection, analysis, interpretation, and dissemination of health-related data needed for the planning, implementation, and evaluation of public health practice.

AMR Surveillance is used to enhance the understanding of the epidemiology of AMR and can be utilized to:

- Distinguish emerging AMR trends and predict trends of antimicrobial resistance in the emirate level generally and in clinical settings more specifically.
- Create local cumulative antibiograms.
- At healthcare facility levels, it helps to identify clusters and potential outbreaks of community-associated (CA) and healthcare-acquired infections (HAI).
- Monitor and guide the effectiveness of antimicrobial stewardship programs (ASP).
- Develop antibiotic guidelines for common infections, and provide healthcare professionals with empiric antimicrobial treatment choices, tailored to the antibiotic resistance epidemiology in the patient's geographic region and setting.

3.1.2. Surveillance Sites

The surveillance sites and laboratories are key to generating and collecting AMR surveillance data and reporting it to Abu Dhabi Public Health Center (ADPHC) AMR team for AMR surveillance.

The AMR data submitted includes routine clinical and antibiotic susceptibility testing data from both public and private healthcare facilities.

Surveillance sites and labs included in this report were identified based on epidemiological needs/gaps, followed by an initial assessment of their location, facility type and size, accessibility, availability of data in the required quality and format, and readiness and willingness to participate. Once identified, strict criteria for participation were applied, including the ability of generating and reporting high quality AMR data, having qualified staff, a quality management system, participation in external quality control and lab accreditation.

3.1.3. Surveillance Sites Selection

An important step in setting up an AMR surveillance system is the selection of representative surveillance sites that meet the minimal criteria for AMR isolate-level surveillance. While it is ideal to collect data from all facilities in the Emirate, this is often not feasible for obvious and practical reasons. Hence, AMR surveillance is often based on a subset of participating health care facilities and laboratories (AMR surveillance sites). While there is no restriction on the number of sites participating in AMR surveillance, several criteria are recommended for inclusion of the sites, the most important of which is achieving local/regional representation.

According to WHO GLASS system, when selecting a potential AMR surveillance site, the following criteria should be considered:

- Support and coordination from facility staff to participate in surveillance to comply with protocols for collecting specimens and to generate the necessary clinical, demographic, and epidemiological data.
- Availability of and accessibility to a laboratory with the capacity and capability to perform microbiological diagnostic testing, adequate staffing levels, equipment, and a reliable supply chain.
- Quality laboratory capacity diagnostics/ confirmation and antimicrobial susceptibility testing (AST), logistical feasibility to routinely collect and transport clinical specimens.
- Ability to manage and report surveillance data.
- Sufficient number of patients and volume of laboratory diagnostic activity to allow a meaningful analysis of surveillance data (population-based);
- Demographic, socioeconomic and geographic representativeness.
- Representation of different levels of health care (tertiary, primary, inpatient, outpatient, ICU, adults, Pediatrics etc.)
- Combination of public and private healthcare facilities.

3.1.4. Identification of Organisms

Participating microbiology laboratories use at least one commercial, automated system for identification of bacteria and/or yeast, including VITEK-2, BD Phoenix, and others such as MicroScan.

3.1.5. Antimicrobial Susceptibility Testing (AST)

Microbiology laboratories use at least one commercial, automated system for routine antimicrobial susceptibility testing, while some use manual testing methods (disc diffusion/Kirby Bauer). Selected organisms (like *Haemophilus* or *Neisseria*) are routinely tested by manual methods (disc diffusion) as per CLSI guideline recommendations. All labs follow the CLSI guidelines for antimicrobial susceptibility testing of bacteria (CLSI-M100) and fungi (CLSI-M60) (CLSI, 2024).

3.1.6. Interpretation of Susceptibility Testing Results

Currently, at the time of the publication of this report, there is a lack of established guidelines in UAE for antibiotic susceptibility testing. For interpretation of susceptibility testing results for fungi and yeast, all participating laboratories routinely apply the CLSI guidelines. If CLSI has not set breakpoints for a certain pathogen/antibiotic combination, then other guidelines are applied and considered, including EUCAST guidelines (EUCAST, 2024) (for tigecycline and amphotericin B), or CDC tentative guidelines (CDC *C. auris*, 2020) for *Candida auris*.

AST data submitted to the AMR surveillance team includes information on the specimen type, specimen collection date, organism name, antibiotic name, AST test method used as well as the measured and/or interpreted AST test results. Wherever available and technically feasible, the measured and numerical AST results are collected and used for the analysis, otherwise the locally interpreted AST result (S/I/R) is used instead.

Clinical and demographic data for each isolate is extracted from hospital/laboratory information systems (HIS/LIS) when available and technically feasible. This includes information on e.g., patient date of birth, age, gender, citizenship status, location, location type, clinical specialty/department, date of admission/discharge, health outcome, etc. Please refer to Annex (1) for further information about the data fields.

3.1.7. Clinical and Demographic Data

Clinical and demographic data for each isolate is extracted from hospital/laboratory information systems (HIS/LIS) wherever available and technically feasible. This includes information on e.g., patient date of birth, age, gender, citizenship status, location, location type, clinical specialty/department, date of admission/discharge, health outcome, etc.

3.1.8. Quality Control

All participating microbiology laboratories must comply with governmental quality standards for clinical laboratories and are:

- Operated by a licensed healthcare provider.
- Either lab-accredited, or in the final steps of lab-accreditation, e.g ISO 15189.
- Headed by a licensed clinical pathologist or clinical microbiologist.
- Expected to conduct routine internal quality control testing (ATCC).
- Successfully participating in at least one internationally recognized, external quality assurance program (EQAS), i.e., CAP PT, ACP-MLE, Joint Commission International (JCI), or REQAS.

3.2. Data Collection

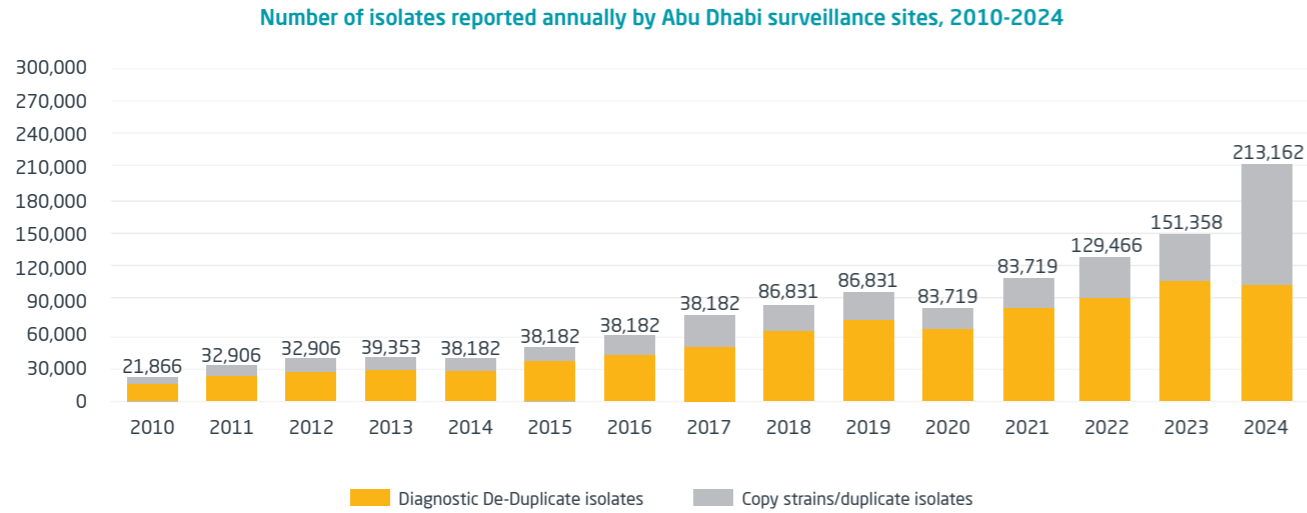
Selected focal points at participating surveillance sites should submit AMR data for the participating sites on a regular basis to the ADPHC AMR Surveillance team (annually, by the end of January of the following year).

The reporting protocol is in line with the UAE national AMR surveillance protocol, which has adopted the global reporting protocols for AMR surveillance (WHO-GLASS, 2015).

The 2024 AMR Surveillance report includes all participating healthcare facilities in the Emirate of Abu Dhabi, minor variation might be reflected in this report in comparison to the national AMR surveillance report.

Since the start of the AMR surveillance system in Abu Dhabi in 2010, the number of bacterial and fungal isolates reported by participating surveillance sites has increased significantly, as shown in **Figure 3.2**.

Figure 3.2: Number of isolates reported by Abu Dhabi AMR surveillance sites, by year (2010-2024)



The Abu Dhabi AMR surveillance system collects information on all bacteria and yeast grown by cultural methods and tested for antimicrobial susceptibility at the participating facilities. For analysis and public health reporting, it focuses then on the following eleven bacterial and fungal pathogens of public health and clinical importance (enhanced surveillance for AMR priority pathogens):

- *Escherichia coli* (*E. coli*)
- *Klebsiella pneumoniae* (*K. pneumoniae*)
- *Salmonella* spp. (*typhi* and *non-typhoidal*)
- *Pseudomonas aeruginosa* (*P. aeruginosa*)
- *Acinetobacter baumannii*
- *Staphylococcus aureus* (*S. aureus*)
- *Streptococcus pneumoniae* (*S. pneumoniae*)
- *Enterococcus faecium* (*E. faecium*)
- *Candida auris*
- *Mycobacterium tuberculosis*.

3.2.1. Data Submission

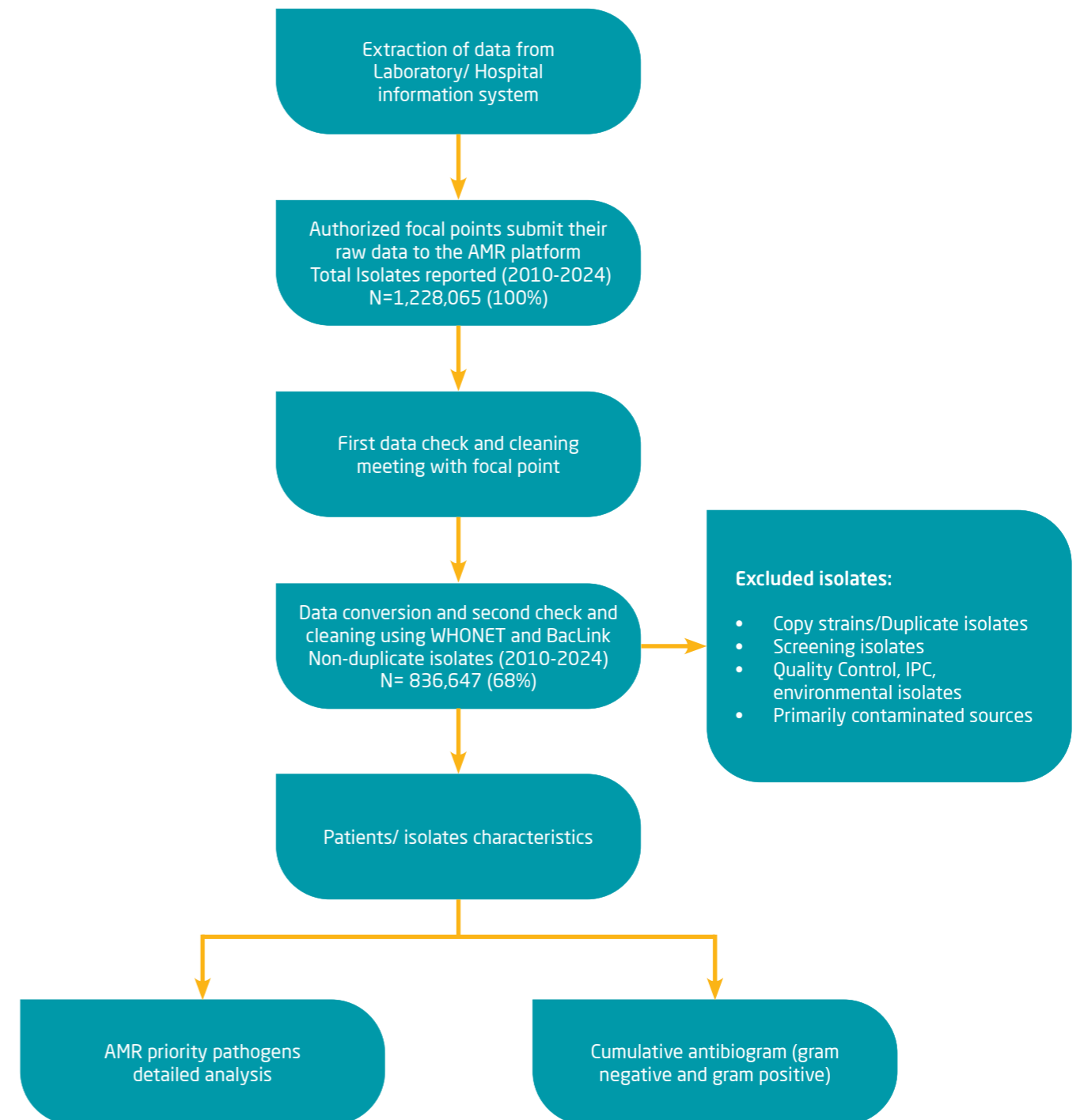
At the healthcare facility level, AMR data is collected and exported from the laboratory/ hospital-information systems (LIS/HIS) or from semi-automated, commercial AST systems. Authorized AMR focal points are submitting the data by email attachment to AMR@adphc.gov.ae.

The file type preferred to be submitted is in the format of Microsoft Excel (HIS/LIS data files) or CSV text file (e.g. VITEK files). All surveillance sites are encouraged to have their AST machines interfaced with their health information system. Rarely, but still acceptable, few labs which don't have interfaced systems can submit data files which include the results as extracted from AST machines directly (e.g., VITEK-2 or BD Phoenix).

3.2.2. Data Cleaning

After submission of AMR data, the raw data is initially checked and cleaned for plausibility, quality and completeness, and feedback is communicated to the AMR focal point at the surveillance sites. If needed, AMR focal points are asked to verify, update, and resubmit the data as applicable. At the ADPHC level, any remaining identifiable quality control strains and screening data are removed from the raw data before further processing and analysis. After conversion of AMR raw data to WHONET format using the BacLink tool, each WHONET AMR data file is checked and cleaned again using an SQLite database browsing tool (DB Browser7). Finally, all WHONET AMR data files are added to Abu Dhabi AMR surveillance database (WHONET, 2024). Figure 3.2.2 illustrates the process in detail.

Figure 3.2.2 AMR surveillance report data generation and cleaning process



3.3. Data Analysis Method

3.3.1. Data Analysis

Data analysis is conducted using the WHONET 2024 Software for Antimicrobial Resistance Surveillance.

The following data were excluded from analysis, if technically feasible:

- Internal quality control isolates (e.g., weekly ATCC QC strains)
- External quality control isolates (EQAS, i.e., CAP-Pt, ACP-MLE, RCPA, REQAS)
- Isolates labelled as 'screening', 'validation', 'verification', 'proficiency testing', or similar
- Suspected screening isolates, e.g.:
 - *S. aureus* isolates from axilla, nose, groin, umbilicus and perineum
 - *S. agalactiae* (GBS) isolates from vagina (LVS, HVS, rectovaginal, etc.)
- Duplicate isolates (copy strains) i.e., only the first isolate per patient, specimen type and species during the reporting period (one year) was included (De-Duplicate isolates only included).
- Isolates from primarily contaminated specimen types (e.g. pedibag)
- Other non-diagnostic isolates (e.g. from environmental sampling or for infection control investigations)
- Species for which less than 10 isolates are available for analysis
- Antimicrobial agents that are selectively/not routinely tested (i.e. less than 70% of isolates were tested).

Antimicrobial susceptibility testing results are presented as the proportion of isolates of a specific microorganism that are:

- susceptible (S),
- intermediate (I),
- resistant (R),
- or non-susceptible (NS, i.e. I+R) to a specific antimicrobial agent.

For example, the number of *E. coli* isolates resistant to ciprofloxacin is divided by the total number of *E. coli* isolates in which susceptibility to this antibiotic was tested.

3.3.2. Definitions Used

The below terms are definitions for commonly used abbreviations in this document

- **MRSA** was defined as *Staphylococcus aureus*, resistant to oxacillin (OXA).
- **VRE** was defined as *Enterococcus faecalis* or *Enterococcus faecium*, resistant to vancomycin (VAN).
- **CRE** was defined as Enterobacteriaceae, non-susceptible to any carbapenem (imipenem, meropenem, or ertapenem).
- **MDR** (multidrug resistance) was defined as acquired non-susceptibility to at least one agent in three or more antimicrobial classes, as suggested by Magiorakos et al. (Magiorakos, et al., 2012).
- **MDR-TB** was defined as combined resistance of *M. tuberculosis* to both, isoniazid (INH) and rifampin (RIF).
- **XDR/PDR**: Magiorakos' et al. definitions for extensively drug-resistant (XDR) and pandrug-resistant (PDR) organisms could not be strictly applied as only a limited number of antibiotic classes were routinely tested by clinical labs, and MDR isolates were not routinely sent to a reference lab. As such, the following modified definitions were used for 'possible XDR' and 'possible MDR' isolates (modifications highlighted in *italics*):
- **'Possible XDR'**: Non-susceptibility to at least one agent *routinely tested by clinical labs* in all but two or fewer antimicrobial categories, (i.e. bacterial isolates remain susceptible to only one or two categories).
- **'Possible PDR'**: Non-susceptibility to all agents *routinely tested by clinical labs* in all antimicrobial categories (i.e. no agents tested as susceptible for that organism).

This report focused on analysis of the acquired antimicrobial resistance and the importance of these bacteria within the healthcare system. Multidrug resistance definitions (MDR) of other bacteria associated with community-acquired infections such as *Streptococcus pneumoniae*, *Salmonella spp.*, *Shigella spp.* and *Neisseria gonorrhoeae* were excluded.

Antibiotics shown in this report are important for antimicrobial resistance surveillance purposes. They may or may not be first-line options for testing susceptibility or for patient treatment and should not be interpreted as such.

3.3.3. Statistical Considerations

Statistical analysis is routinely conducted with WHONET 2024. To obtain a reasonable statistical estimate of cumulative %S rates, it is desirable to include only bacteria with 30 or more isolates of a given species during the analysis period (generally a calendar year). If fewer than 30 AST results for a specific pathogen-antibiotic combination were available for analysis, then the table data are presented, but marked with a footnote, indicating that results should be interpreted with caution. If fewer than 10 AST results for a specific pathogen-antibiotic combination were submitted, then percentage susceptible/intermediate/resistant (%RIS) results are not presented.

04

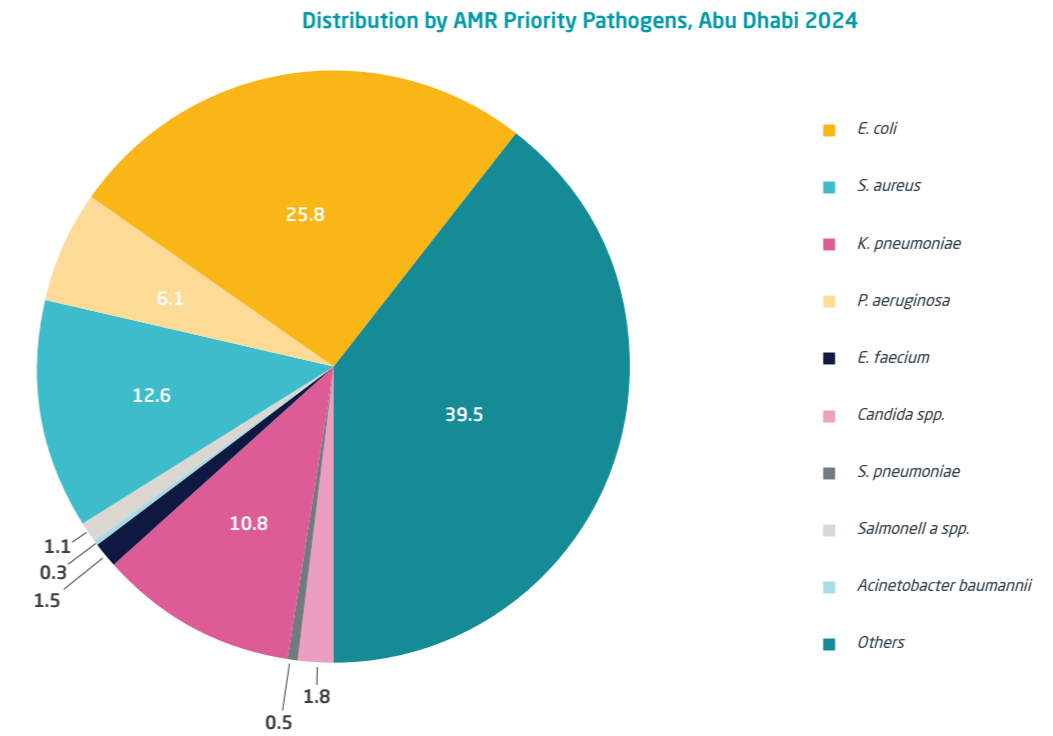
Results

4.1. Patients/Isolates characteristics

4.1.1. Pathogen Distribution

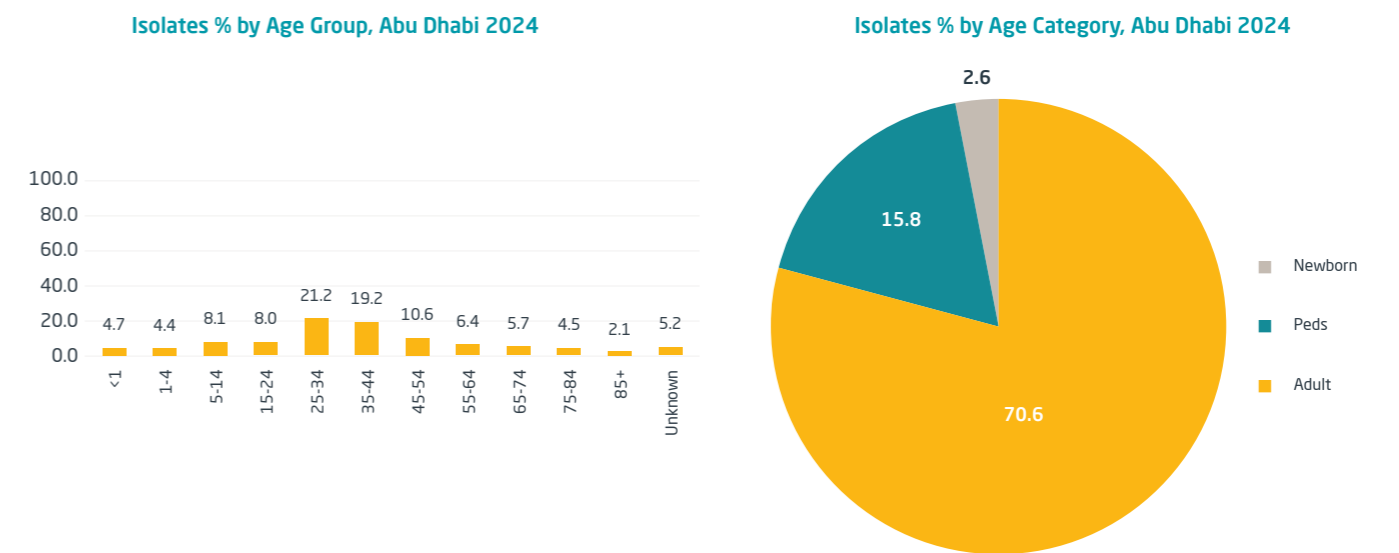
For 2024, all AMR priority pathogens together accounted for 60.5% of the total reported isolates. The most frequently reported pathogens were *E. coli* (25.8 %) followed by *S. aureus* (12.6%), *K. pneumoniae* (10.8%), and *P. aeruginosa* (6.1%) (Figure 4.1.1).

Figure 4.1.1: Distribution of reported AMR priority pathogens in Abu Dhabi 2024, by pathogen



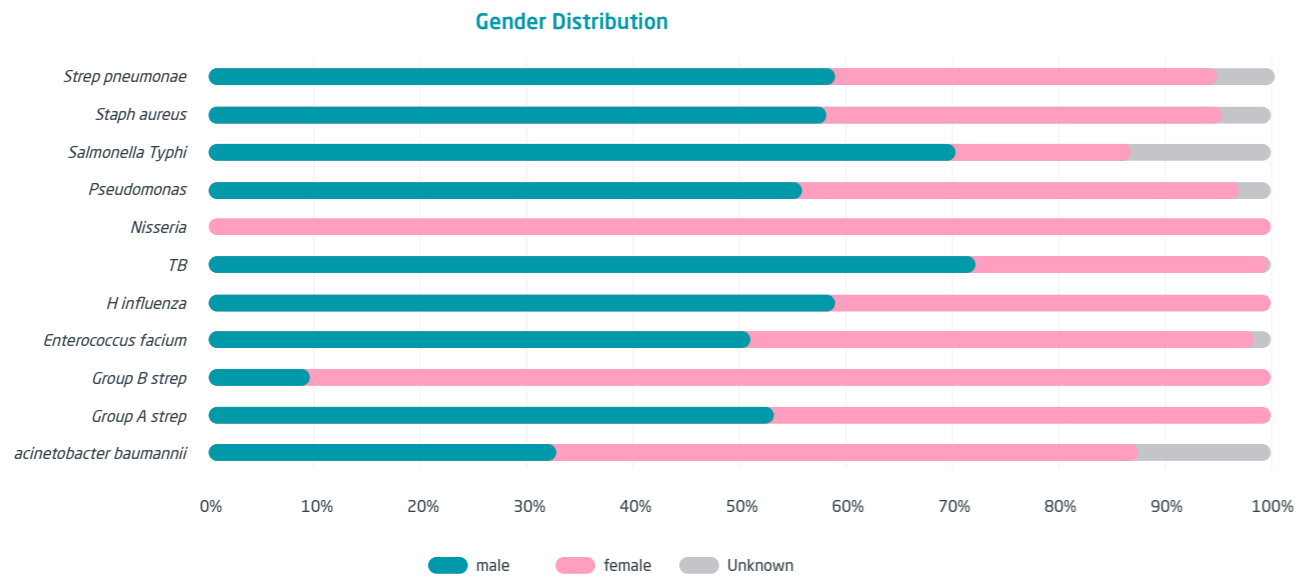
4.1.2. Age-group

Figure 4.1.2: Distribution of reported AMR Priority pathogens Abu Dhabi 2024, by age group and age category



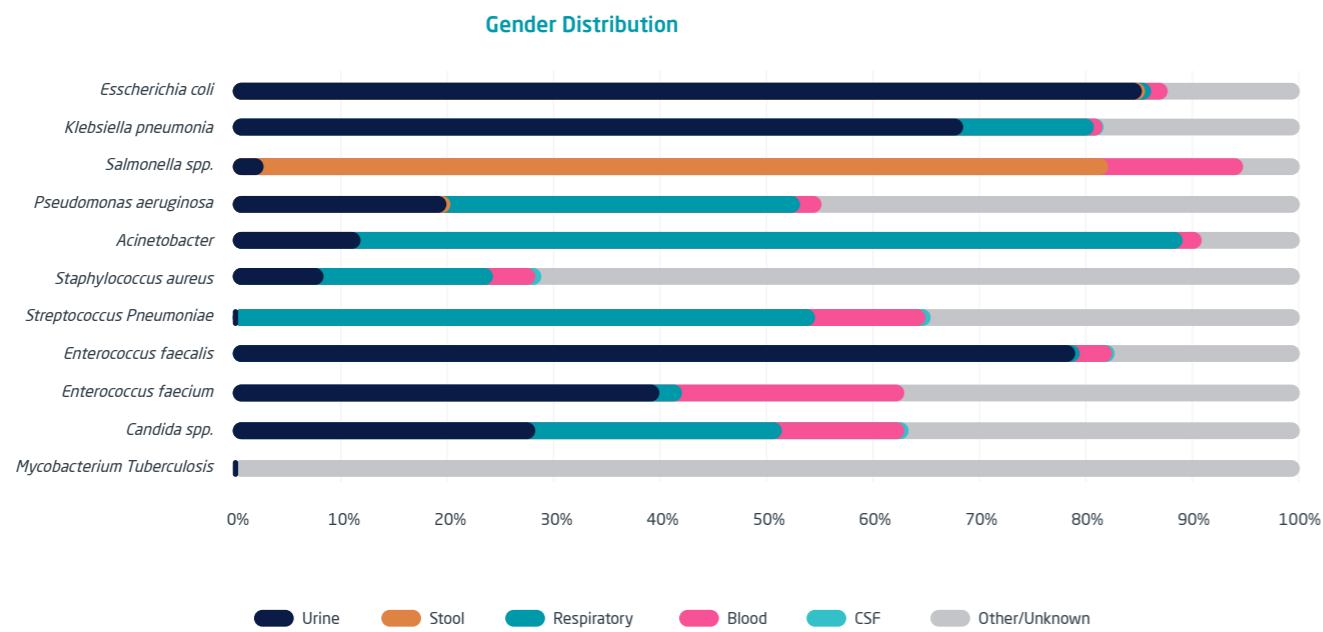
4.1.3. Gender

Figure 4.1.3: Distribution of reported AMR priority pathogens Abu Dhabi 2024, by gender



4.1.4. Isolate Source

Figure 4.1.4: Distribution of all reported AMR priority pathogen among all Abu Dhabi Regions, by isolate source, 2024



05

AMR Priority Pathogens

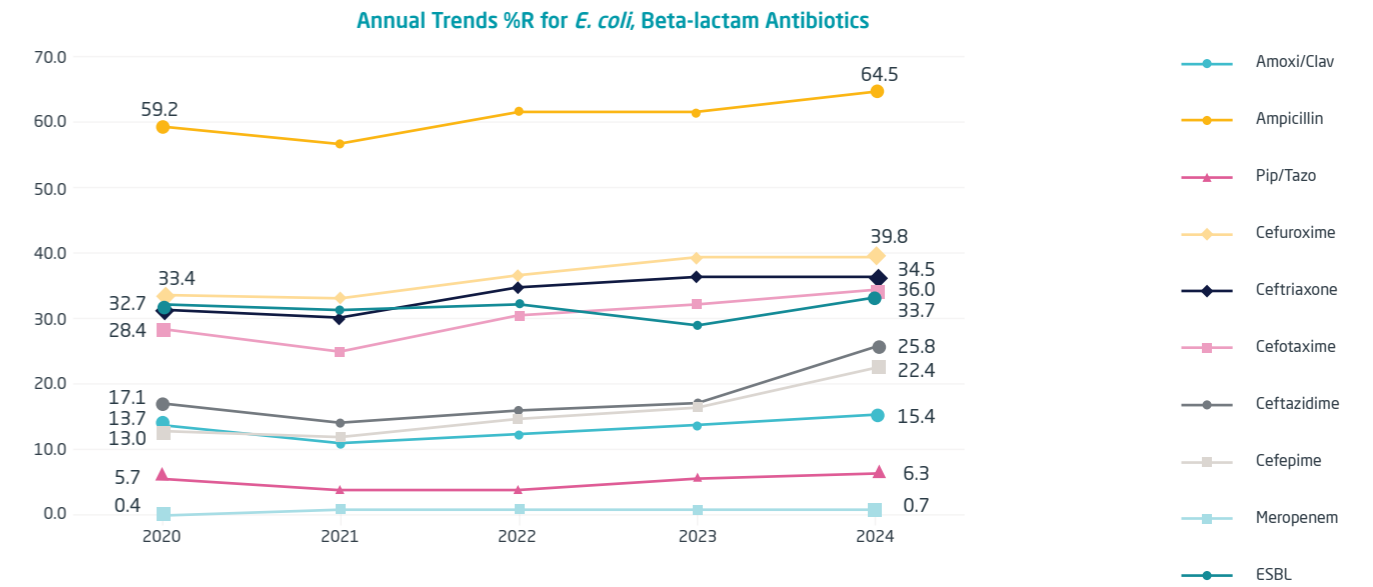
5.1. *Escherichia coli*

Table 5.1: Percentages of resistant isolates for *Escherichia coli*, isolates from all sources, Abu Dhabi 2024 (total number of *E. coli* isolates= 26,841)

Antibiotic	Isolates (N)	%R	I%	S%
Ampicillin	17,509	64.5	1.2	34.3
Amoxicillin/clavulanic acid	23,224	15.4	9.5	75.1
Piperacillin/tazobactam	24,844	6.3	0.6	93.1
Cefuroxime (oral)	16,073	39.8	3.3	56.9
Ceftriaxone	15,444	36.0	0.1	63.9
Cefotaxime	9,275	34.5	0.9	64.6
Extended-spectrum β-lactamase	7,061	33.7	0.0	66.3
Ceftazidime	20,466	25.8	4.0	70.2
Cefepime	22,890	22.4	2.3	75.3
Ertapenem	20,783	0.8	0.1	99.2
Imipenem	21,224	0.9	0.3	98.7
Meropenem	22,916	0.7	0.1	99.1
Gentamicin	25,121	9.5	0.4	90.1
Tobramycin	3,105	13.5	0.8	85.6
Amikacin	16,087	2.6	1.8	95.7
Ciprofloxacin	24,566	34.6	10.3	55.1
Trimethoprim/sulfamethoxazole	24,701	37.1	0.0	62.8
Fosfomycin ^a	15,414	1.3	0.2	98.5
Nitrofurantoin	20,102	1.9	2.5	95.7
Multidrug-resistant ^b	26,841	34.4	-	-
Extensive Drug resistance (possible)	26,841	2.4	-	-
Pan-drug resistance (possible)	26,841	0.03	-	-

^a Fosfomycin and Nitrofurantoin: Isolates from urinary tract only.
^b Multidrug resistance (MDR) was defined as acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

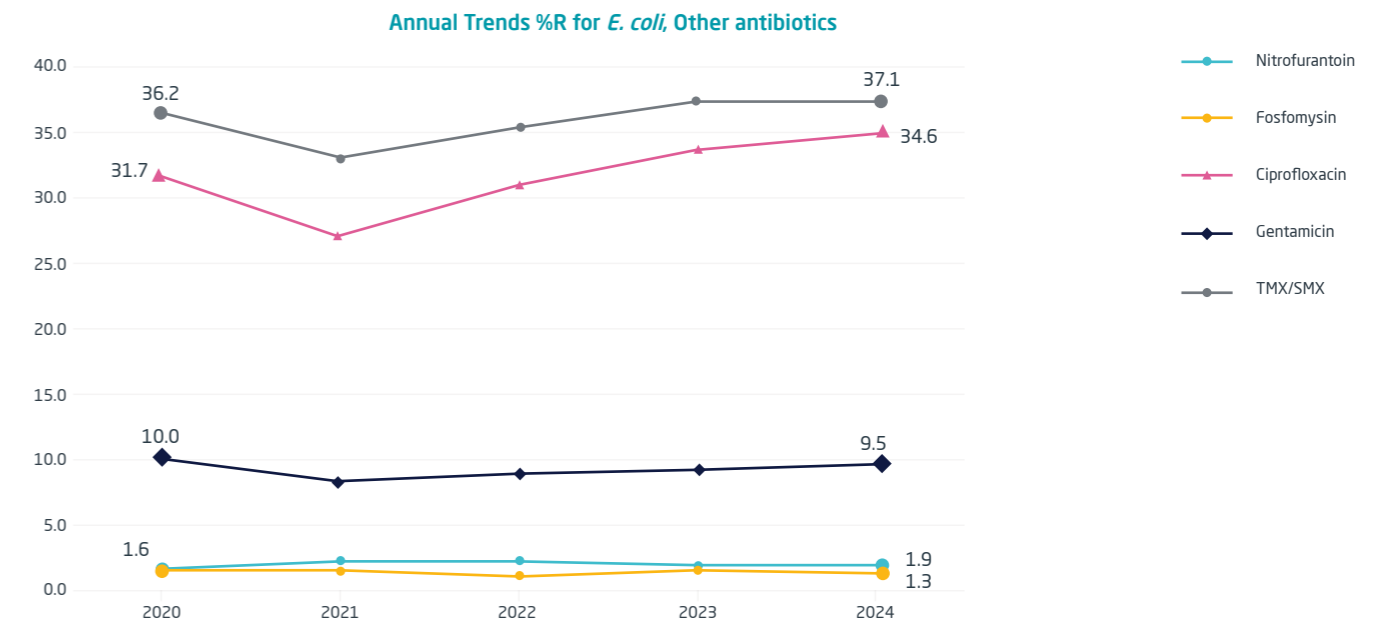
Figure 5.1.1.: Annual trends for percentage of isolates resistant (%R) for *Escherichia coli*, Abu Dhabi, 2020-2024 - Beta-lactam Antibiotics



For beta-lactam antibiotics, *Escherichia coli* shows trends of resistance:

- Slight increase of percentages noted for second-generation (cefuroxime), third generation (cefotaxime, ceftriaxone, ceftazidime) and fourth-generation cephalosporins (cefepime).
- Broad-spectrum penicillins trends are slightly fluctuating upwards for piperacillin/tazobactam from 5.7%R (2020) to 6.3%R (2024).
- No significant change of ESBL rate over the last five years (33.7%R in 2024) and resistance to carbapenems (imipenem, meropenem) remains low ($\leq 1\%$).

Figure 5.1.2: Annual trends for percentage of isolates resistant (%R) for *Escherichia coli*, Abu Dhabi, 2020-2024 - Other antibiotics



E. coli shows fluctuating trends of resistance for Fluoroquinolones (ciprofloxacin) and decreasing or horizontal trends of resistance for Trimethoprim/sulfamethoxazole, aminoglycosides (Gentamicin) and Nitrofurantoin.

5.2. *Klebsiella pneumoniae*

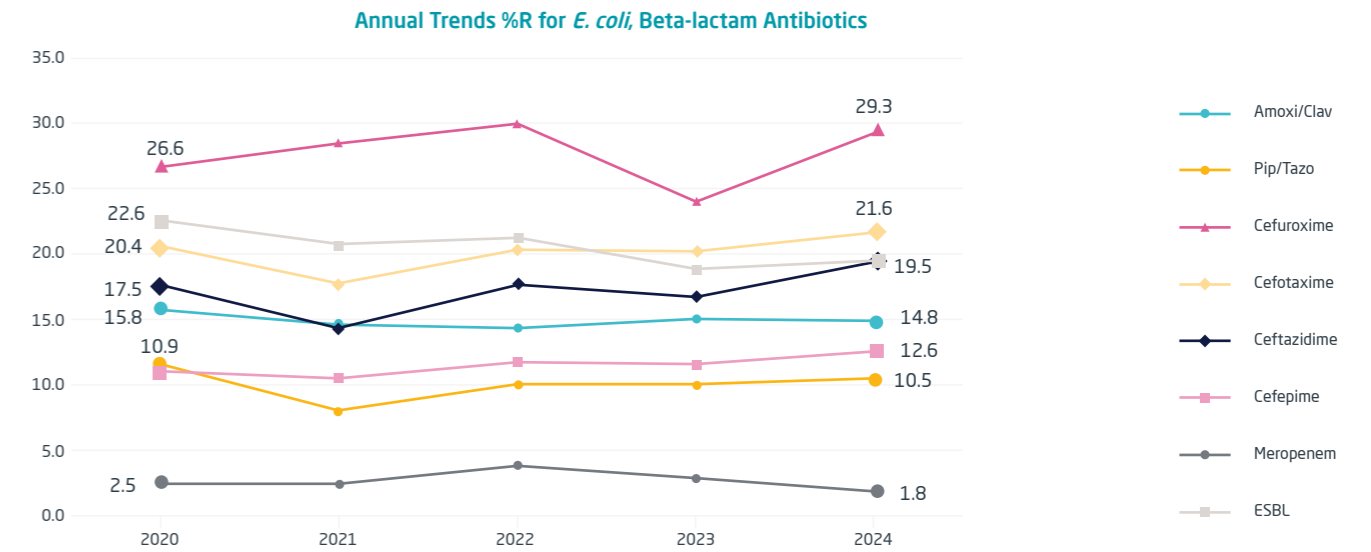
Table 5.2: Percentages of resistant isolates for *Klebsiella pneumoniae*, isolates from all sources, Abu Dhabi 2024 (Total number of *K. pneumoniae* isolates=11,258)

Antibiotic	Isolates (N)	%R	I%	S%
Ampicillin	7,719	97.5	2.1	0.3
Amoxicillin/clavulanic acid	9,213	14.8	5.9	79.3
Piperacillin/tazobactam	10,227	10.5	3.1	87.0
Cefuroxime (oral)	6,067	29.3	1.9	68.8
Ceftriaxone	5,989	23.2	0.7	76.2
Cefotaxime	4,201	21.6	1.8	76.6
Extended-spectrum β-lactamase	3,140	19.5		80.5
Ceftazidime	8,352	19.5	3.3	77.2
Cefepime	9,387	12.6	0.9	86.4
Ertapenem	8,331	1.8	0.2	98.0
Imipenem	8,374	3.9	0.9	95.2
Meropenem	9,332	1.8	0.2	98.0
Gentamicin	10,364	5.3	0.2	94.5
Tobramycin	1,588	14.2	0.9	84.8
Amikacin	6,669	2.6	0.4	97.0
Ciprofloxacin	10,112	20.0	6.1	73.8
Trimethoprim/sulfamethoxazole	10,148	18.8	0.0	81.1
Nitrofurantoin ^a	6,373	19.5	43.1	37.4
Multidrug-resistant ^b	11,258	22.2	-	-
Extensive Drug resistance (possible)	11,258	4.2	-	-
Pan-drug resistance (possible)	11,258	0.36	-	-

^a Nitrofurantoin: Isolates from urinary tract only.

^b Multidrug resistance (MDR) was defined as acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

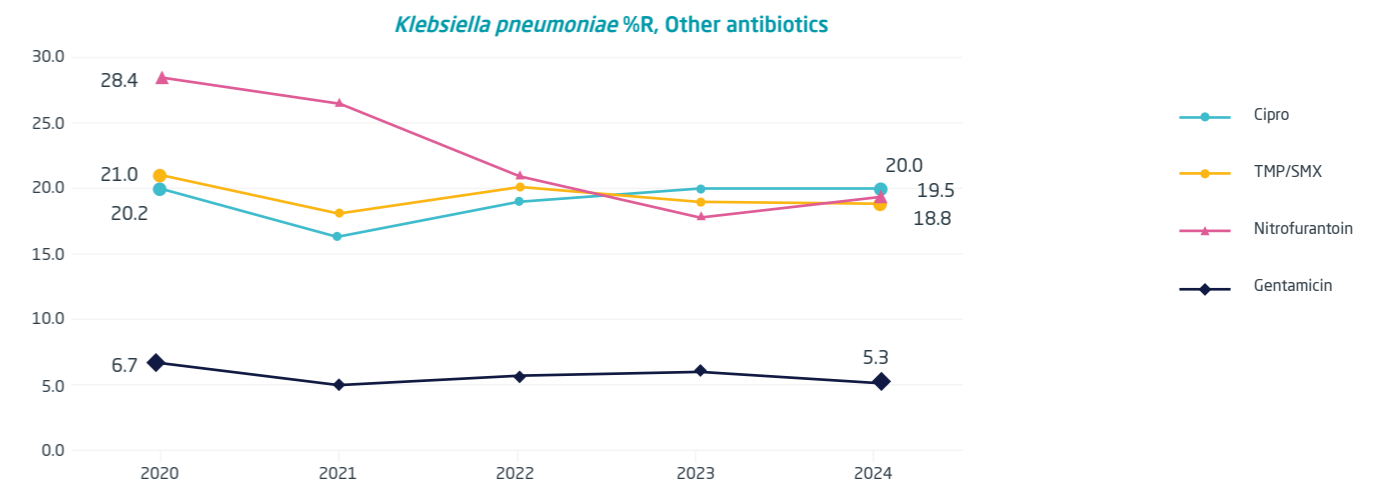
Figure 5.2.1: Annual trends for percentage of isolates resistant (%R) for *Klebsiella pneumoniae*, Abu Dhabi, 2020-2024 - Beta-lactam Antibiotics



Klebsiella pneumoniae shows overall slightly increasing or horizontal fluctuating trends of resistance for most beta-lactam antibiotics including:

- Broad-spectrum penicillins (amoxicillin/clavulanic acid) - but not piperacillin/ tazobactam,
- Second-generation (cefuroxime), third-generation (ceftazidime, cefotaxime) and fourth-generation (cefepime) cephalosporins.

Figure 5.2.2: Annual trends for percentage of isolates resistant (%R) for *Klebsiella pneumoniae*, Abu Dhabi, 2020-2024 - Other antibiotics



Klebsiella pneumoniae shows no significant trends of resistance to fluoroquinolones (ciprofloxacin) from 20.2%R (2020) to 20.0%R (2024) and a fluctuating, but overall decreasing trend of resistance to nitrofurantoin to 19.5%R in 2024.

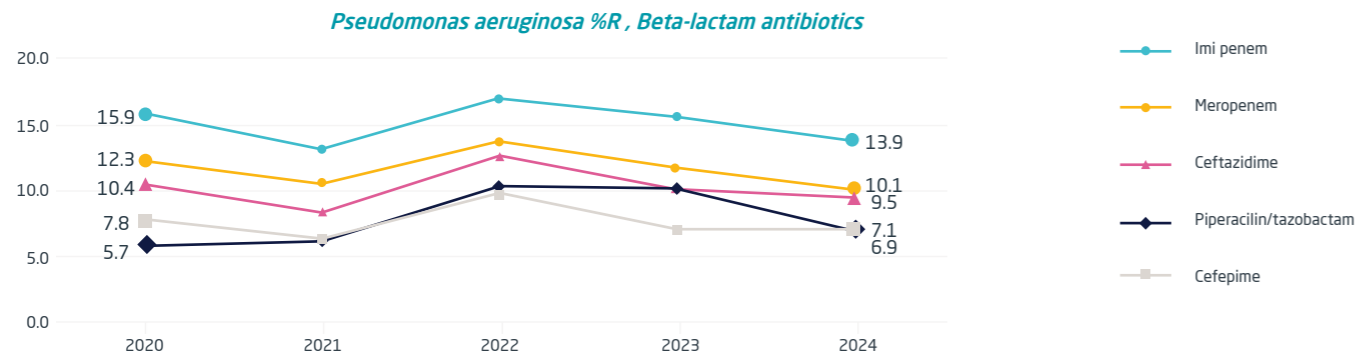
5.3. *Pseudomonas aeruginosa*

Table 5.3: Percentages of resistant isolates for *Pseudomonas aeruginosa*, isolated from all sources, Abu Dhabi 2024 (Total number of isolates= 6,390)

Antibiotic	Isolates (N)	%R	I%	S%
Piperacillin/tazobactam	5,031	6.9	2.0	91.2
Ceftazidime	5,552	9.5	4.0	86.4
Cefepime	5,546	7.1	4.4	88.6
Imipenem	5,408	13.9	2.8	83.2
Meropenem	5,488	10.1	4.0	85.9
Gentamicin	3,347	4.2	4.1	91.7
Tobramycin	2,410	5.1	1.3	93.6
Amikacin	4,627	3.0	0.8	96.1
Ciprofloxacin	5,485	10.9	3.1	85.9
Multidrug-resistant (MDR) ^a	6,390	9.3	-	-
Extensive Drug resistance (possible)	6,390	8.1	-	-
Pan-drug resistance (possible)	6,390	1.3	-	-

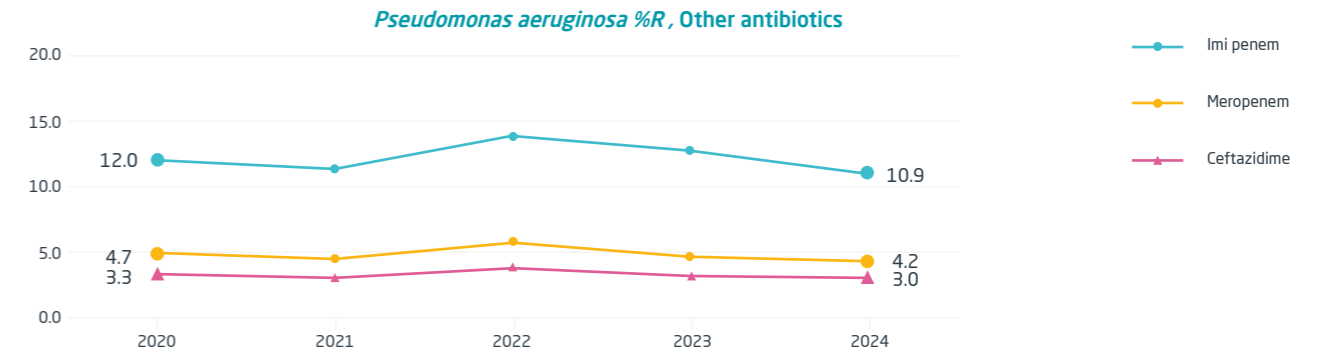
^a Multidrug resistance (MDR) was defined as acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

Figure 5.3.1: Annual trends for percentage of isolates resistant (%R) for *Pseudomonas aeruginosa*, Abu Dhabi, 2020-2024 - Beta-lactam antibiotics



Pseudomonas aeruginosa shows overall a slight decrease in resistance trends over the last five years to Beta-lactam antibiotics, including 3rd- and 4th-generation cephalosporins (ceftazidime, cefepime), except for broad-spectrum penicillins (piperacillin-tazobactam) which increased from 5.7 %R (2020) to 6.9 %R (2024). Resistance trends for carbapenems show a slight decrease of resistance for both: imipenem (IMP) from 15.9 to 13.9 %R and meropenem (MEM) from 12.3 to 10.1%R.

Figure 5.3.2: Annual trends for percentage of isolates resistant (%R) for *Pseudomonas aeruginosa*, Abu Dhabi, 2020-2024 - Other antibiotics



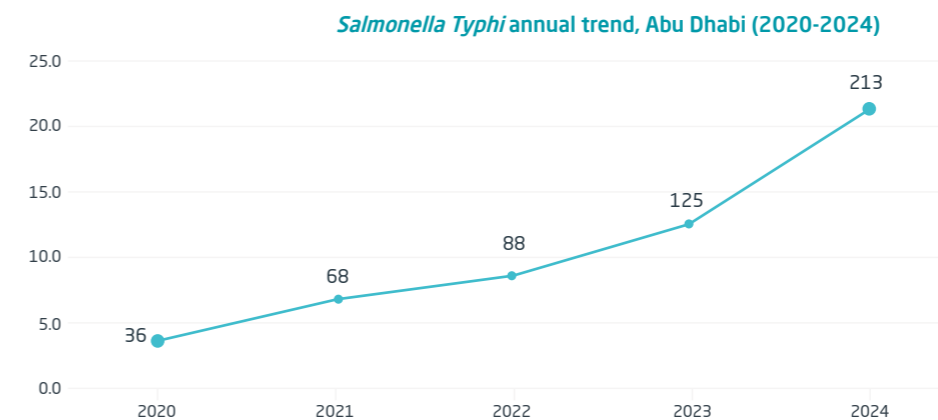
Pseudomonas aeruginosa shows a decrease in trend of resistance for fluoroquinolones (ciprofloxacin) from 12%R to 10.9 %R over the last five years, and a horizontal trend of resistance for aminoglycosides (gentamicin, amikacin).

5.4. *Salmonella* spp. (Typhi and Non-typhoid)

Table 5.4: Percentages of resistant isolates for *Salmonella* spp., isolates from all sources, Abu Dhabi 2024

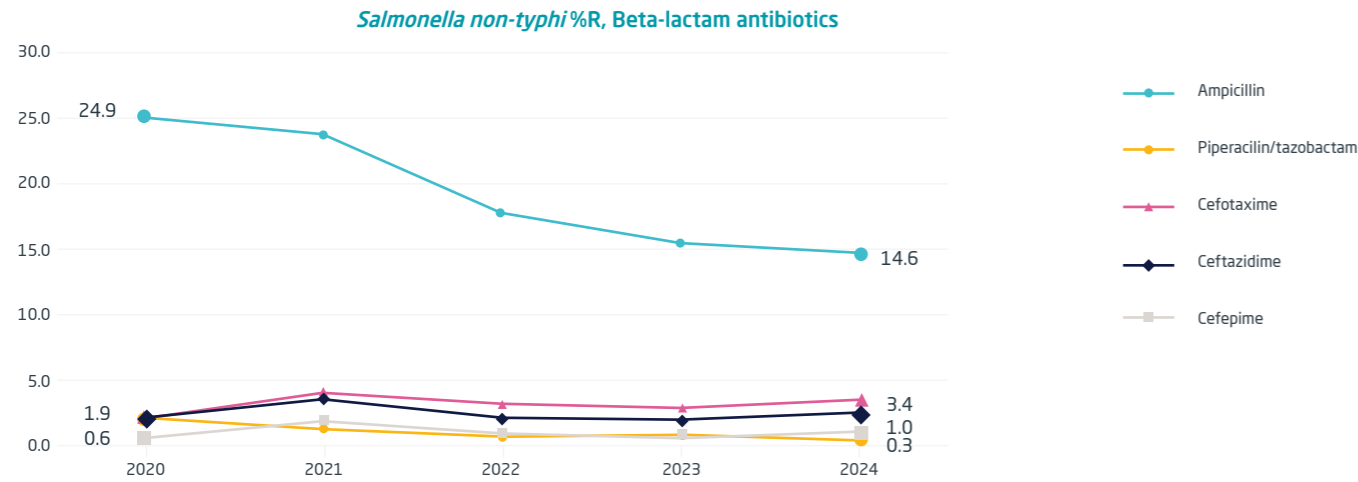
Antibiotic	<i>Salmonella Non-Typhi</i> (N=1,007)				<i>Salmonella Typhi</i> (N=213)			
	Isolates (N)	%R	I%	S%	Isolates (N)	%R	I%	S%
Ceftriaxone	454	2.4	0.0	97.6	88	13.6	0	86.4
Cefotaxime	411	3.4	0.2	96.4	36	22.2	0	77.8
Ceftazidime	564	2.0	0.2	97.8	64	15.6	0	84.3
Ertapenem	565	0.0	0.0	100.0	60	0	0	100
Imipenem	556	0.0	0.0	100.0	66	3	0	95.5
Meropenem	574	0.0	0.0	100.0	72	0	0	100
Ciprofloxacin	579	9.2	11.2	79.6	116	48.3	34.5	17.2
Trimethoprim/sulfamethoxazole	863	2.7	0.0	97.4	112	13.9	0	86.1

Figure 5.4.1: Annual trends for number of de-duplicated *Salmonella typhi* isolates, Abu Dhabi, 2020-2024



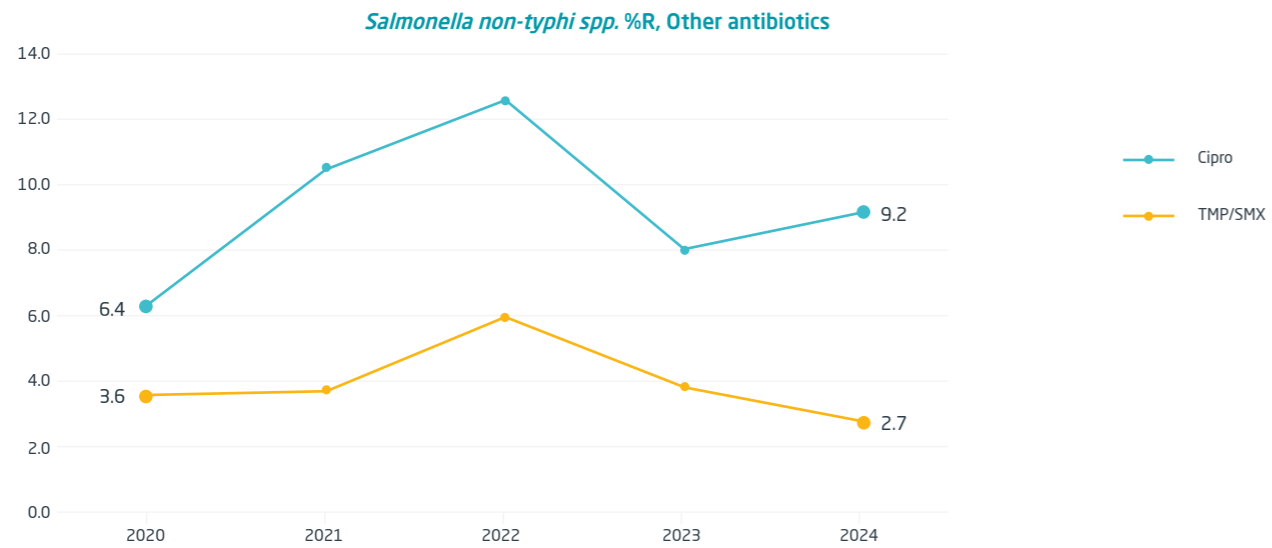
Number of *Salmonella typhi* isolates increased significantly over the last five years from 36 to 213 isolates in 2024. Thus, pattern of trends over five years was not presented due to small number of isolates. The below figures present annual trends of *salmonella* (*non typhi*) which has been part of the AMR surveillance system over the previous years.

Figure 5.4.2: Annual trends for percentage of isolates resistant (%R) for *Salmonella* (non-typhi), Abu Dhabi, 2020-2024 - Beta-lactam antibiotics



For *Salmonella spp.* (non-typhoidal), the trend of resistance is decreasing for aminopenicillins (ampicillin) and for broad-spectrum penicillins (piperacillin-tazobactam). Resistance to third-generation cephalosporins are low (<5% R for cefotaxime, ceftazidime during the period between 2020-2024).

Figure 5.4.3: Annual trends for percentage of isolates resistant (%R) for *Salmonella spp.*, Abu Dhabi, 2020-2024 -Other antibiotics



Resistance to fluoroquinolones (ciprofloxacin) has been overall increasing since 2020, from 6.4%R (2020) to 9.2 %R (2024), whereas TMP/SMX showed an overall downward trend to now 2.7 %R (2024).

5.5. *Acinetobacter baumannii*

Percentages of resistant isolates for *Acinetobacter baumannii*, isolates from all sources, Abu Dhabi 2024 (Total number of isolates=569)

Antibiotic	Isolates (N)	%R	I%	S%
Piperacillin/tazobactam	532	7.3	1.7	91.0
Ceftazidime	524	5.2	4.6	90.3
Cefepime	480	5.8	1.5	92.7
Imipenem	520	4.4	0.2	95.4
Meropenem	524	4.6	0.2	95.2
Gentamicin	536	4.5	0.7	94.8
Tobramycin	328	5.2	0.6	94.2
Amikacin	157	1.9	0.6	97.5
Ciprofloxacin	509	7.9	4.7	87.4
Trimethoprim/Sulfamethoxazole	524	5.2	-	94.8
Minocycline	532	7.3	1.7	91.0
Tetracycline	524	5.2	4.6	90.3
Multidrug-resistant	569	5.3	-	-
Extensive Drug resistance (possible)	569	4.2	-	-
Pan-drug resistance (possible)	569	0.7	-	-

^a Multidrug resistance (MDR) was defined as acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

Figure 5.5.1: Annual trends for percentage of isolates resistant (%R) for *Acinetobacter baumannii*, Abu Dhabi, 2020-2024 - Beta-lactam antibiotics

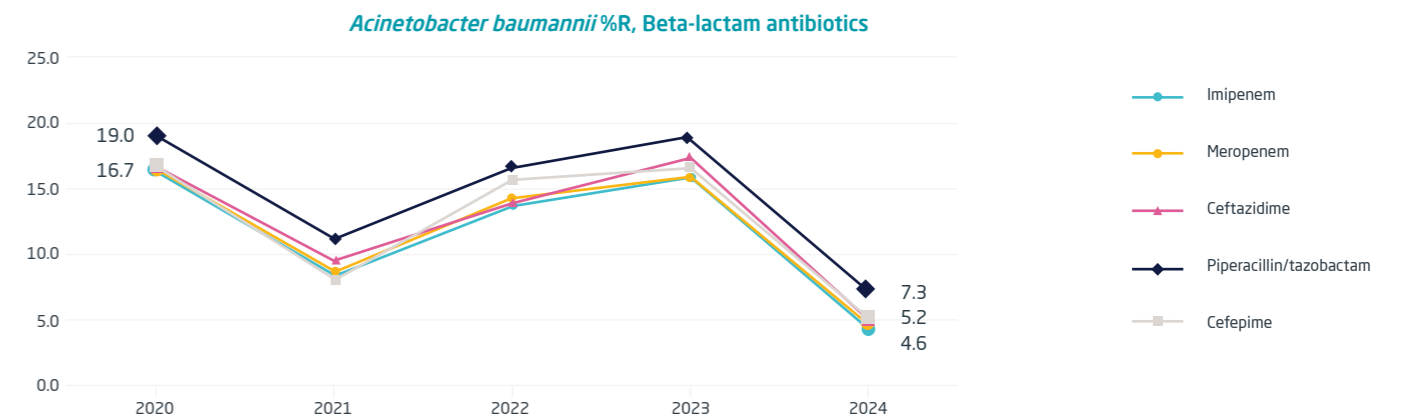
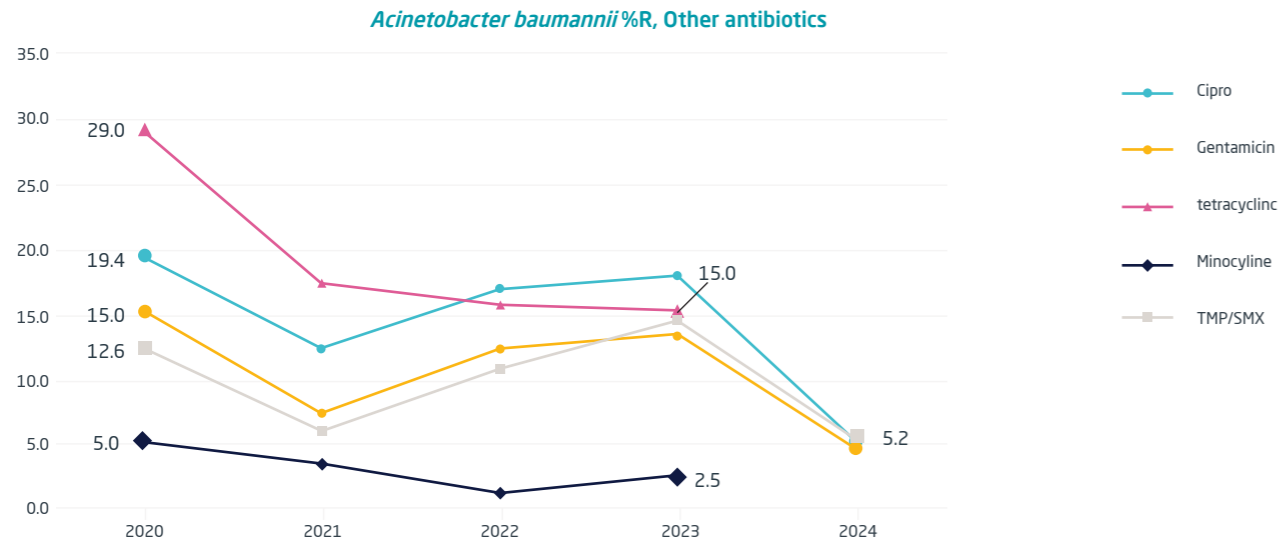


Figure 5.5.2: Annual trends for percentage of isolates resistant (%R) for *Acinetobacter baumannii*, Abu Dhabi, 2020-2024 -Other antibiotics



Acinetobacter spp. shows decreasing trends of resistance for all beta-lactam antibiotics and other antibiotics including aminoglycosides, fluoroquinolones, trimethoprim/sulfamethoxazole, minocycline and tetracycline.

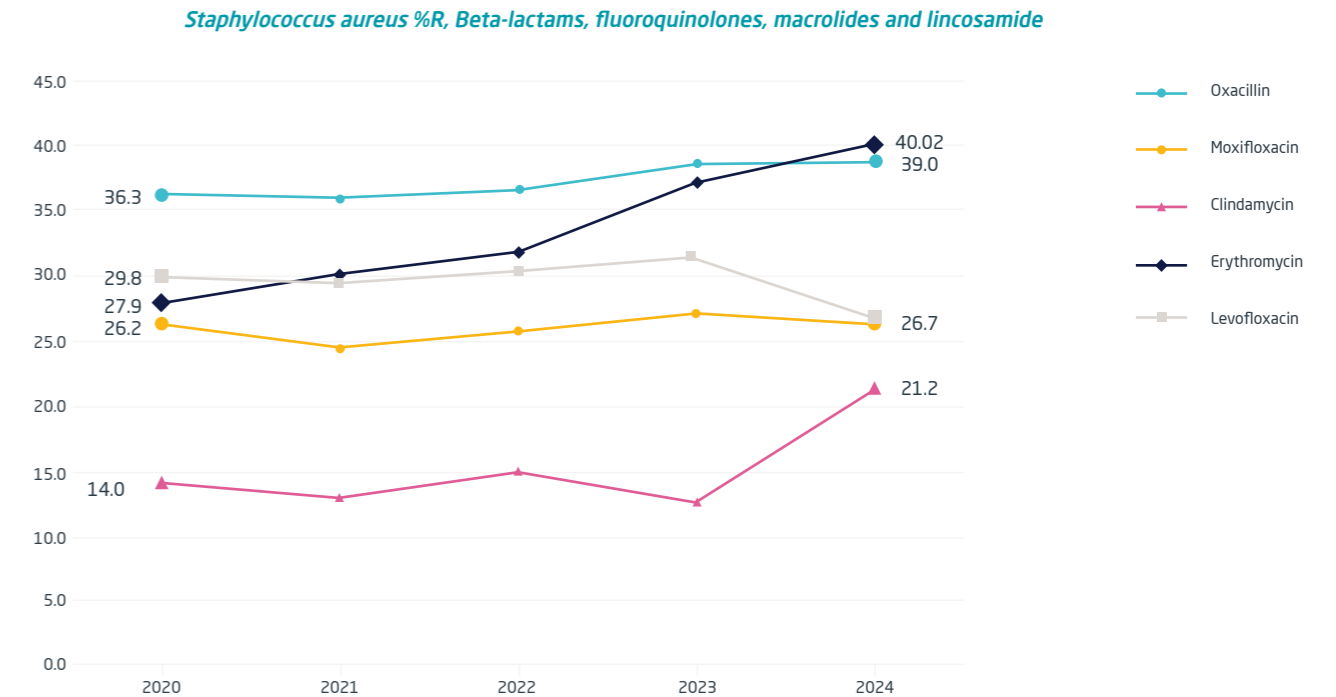
5.6. Staphylococcus aureus

Table 5.6: Percentages of resistant isolates for *Staphylococcus aureus*, isolates from all sources, Abu Dhabi 2024 (Total number of isolates=13,082)

Antibiotic	Isolates (N)	%R	I%	S%
Oxacillin	10,576.0	12.9	0.3	86.9
Gentamicin	10,536.0	9.1	2.9	88.0
Rifampin	6,432.0	0.5	0.8	98.6
Ciprofloxacin	2,550.0	32.3	1.9	65.8
Levofloxacin	3,167.0	26.7	2.3	71.0
Moxifloxacin	6,457.0	26.4	5.8	67.8
Trimethoprim/Sulfamethoxazole	10,564.0	20.9	0.0	79.0
Clindamycin	10,535.0	21.2	0.2	78.7
Erythromycin	10,230.0	40.2	1.2	58.6
Linezolid	9,431.0	0	0	99.7
Vancomycin	9,954.0	0.3	0.0	99.7
Quinupristin/Dalfopristin	1,114.0	17.9	0.0	82.1
Tigecycline	7,779.0	0.0	0.0	100.0
Multidrug-resistant (MDR) ^c	13,082	35.7	-	-
Extensive Drug resistance (possible)	13,082	0.3	-	-
Pan-drug resistance (possible)	13,082	0.0	-	-

^a MRSA/MSSA is calculated as resistance/susceptibility to oxacillin: %MRSA = 12.9% and %MSSA = 86.9%.
^b Tigecycline: EUCAST breakpoints (S≤0.5, R>0.5)
^c Multidrug resistance (MDR) was defined as isolates being either a known MRSA or having acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

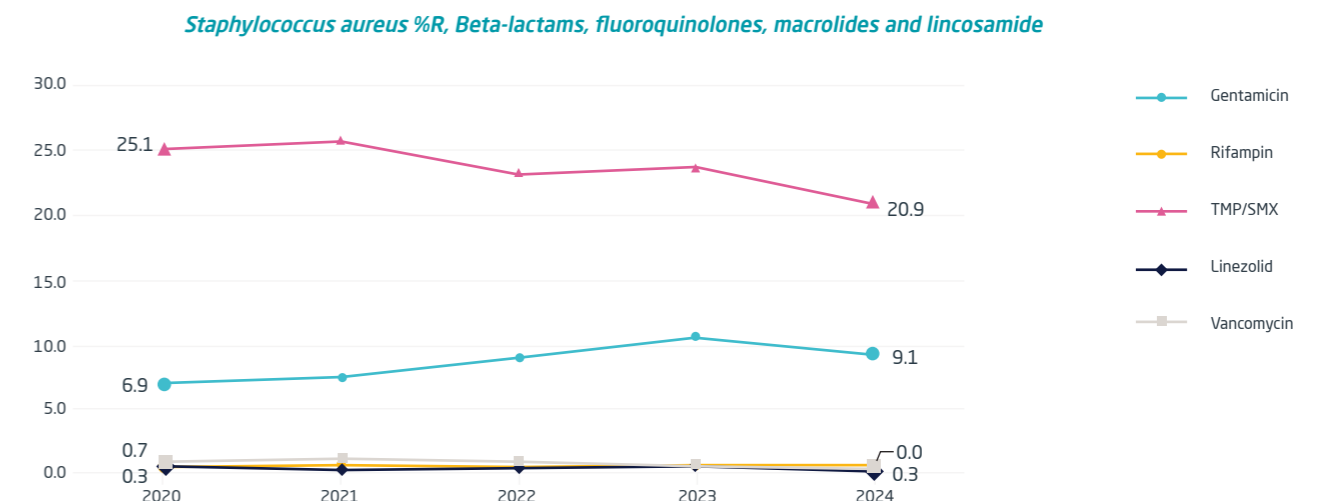
Figure 5.6.1: Annual trends for percentage of isolates resistant (%R) for *Staphylococcus aureus*, Abu Dhabi, 2020-2024 - Beta-lactams, fluoroquinolones, macrolides and lincosamides



Staphylococcus aureus shows increasing trends of resistance for macrolides, and lincosamides:

- Beta-lactam antibiotics: %MRSA increased from 36.3% (2020) to 39% (2024).
- Fluoroquinolones: resistance to levofloxacin had dropped from 29.8% in (2020) to 26.7% in (2024) and moxifloxacin resistance remained on horizontal trend from 26.2% in (2020) to 26.4% in (2024)
- Macrolides: resistance to erythromycin increased from 27.9% (2020) to 40.2% (2024).
- Lincosamides: resistance to clindamycin increased from 14% (2020) to 21.2 % (2024).

Figure 5.6.2: Annual trends for percentage of isolates resistant (%R) for *Staphylococcus aureus*, Abu Dhabi, 2020-2024 - Other Antibiotics



Overall, *Staphylococcus aureus* shows stable trends of resistance for other antibiotics:

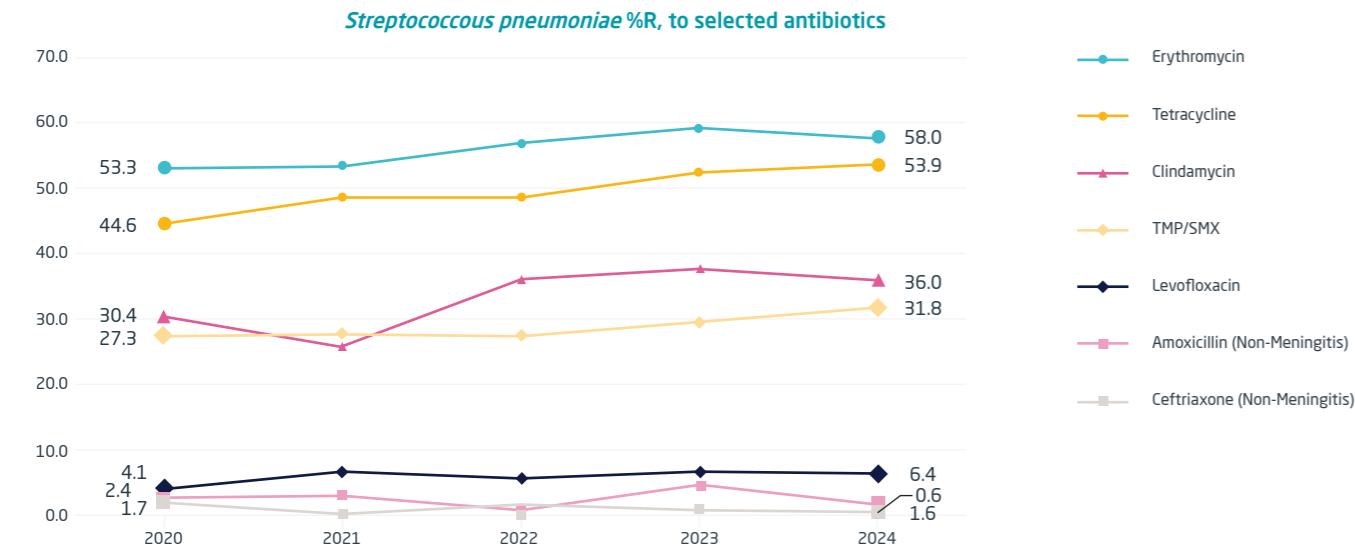
- Trimethoprim/sulfamethoxazole: resistance nicely trending down from 25.1 %R (2020) to 20.9 %R (2024)
 - Aminoglycosides (gentamicin): resistance is slowly increasing from 6.9 %R (2020) to 9.1 %R (2024)
- Resistance to rifampin and linezolid remains very low (< 1%).
 Confirmed resistance to glycopeptides (vancomycin) was not observed.

5.7. *Streptococcus pneumoniae*

Table 5.7: Percentages of resistant isolates for *Streptococcus pneumoniae*, isolates from all sources, Abu Dhabi 2024 (Total number of isolates= 1,574)

Antibiotic	Isolates (N)	%R	I%	S%
Penicillin G (oral breakpoints)	1,175	18.0	30.0	52.0
Penicillin G (non-meningitis breakpoints)	1,175	17.1	25.2	57.7
Penicillin G (meningitis breakpoints)	1,175	23.0	25.0	52.0
Amoxicillin (non-meningitis breakpoints)	123	1.6	6.5	91.9
Cefotaxime (non-meningitis breakpoints)	440	5.0	2.7	92.3
Ceftriaxone (non-meningitis breakpoints)	1,355	0.6	0.7	98.7
Rifampin	316	0.6	0.0	99.4
Levofloxacin	830	6.4	0.7	92.9
Moxifloxacin	941	0.1	0.4	99.5
Trimethoprim/Sulfamethoxazole (TMP/SMX)	1,427	31.8	7.6	60.7
Clindamycin	1,346	36.0	0.4	63.6
Erythromycin	1,440	58.3	0.2	41.5
Linezolid	1,336	0.0	0.2	99.8
Vancomycin	1,430	0.0	1.3	98.7
Quinupristin/Dalfopristin	124	0.8	0.0	99.2
Tetracycline	1,431	53.9	1.0	45.1

Figure 5.7.1: Annual trends for percentage of isolates resistant (%R) for *Streptococcus pneumoniae*, Abu Dhabi, 2020-2024



For beta-lactam antibiotics, resistance to Amoxicillin and Ceftriaxone remained low. However, resistance to macrolides, fluoroquinolones and Trimethoprim/Sulfamethoxazole are on upward trends.

- Macrolides: resistance to Erythromycin increased from 53.3 % (2020) to 58.0 % (2024).
- Trimethoprim/Sulfamethoxazole resistance increased from 27.3 % (2020) to 31.8 % (2024).
- Fluoroquinolones resistance increased from 4.1% (2020) to 6.4 (2024) for levofloxacin.

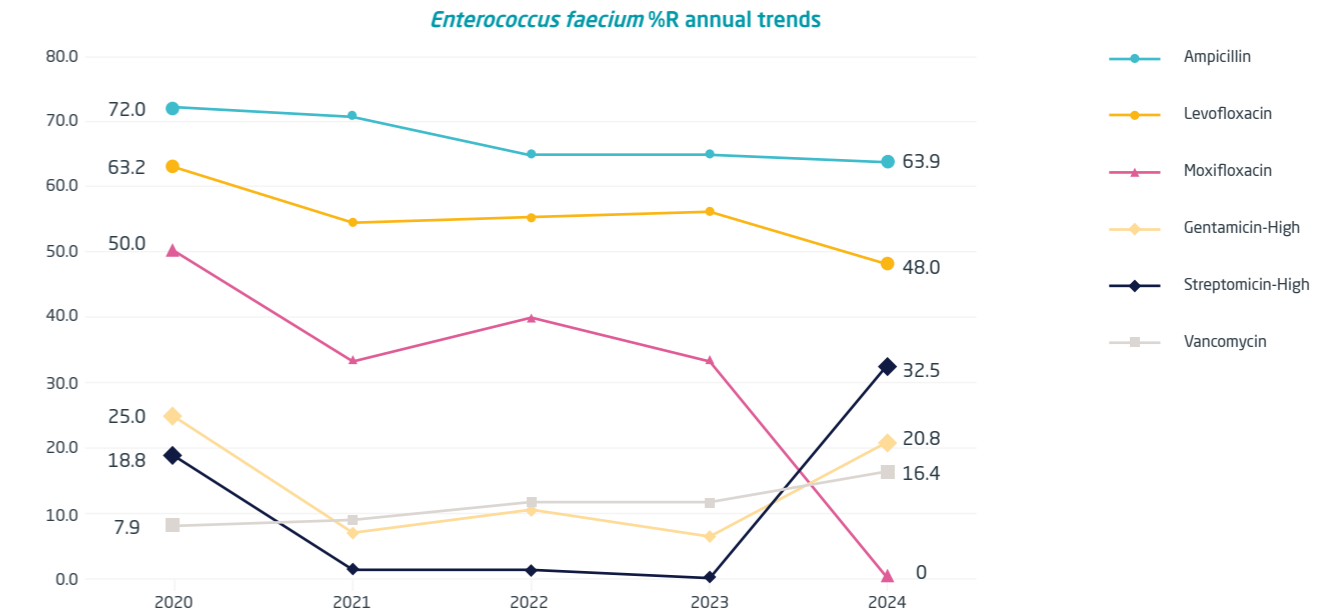
5.8. *Enterococcus faecium*

Table 5.8: Percentages of resistant isolates for *Enterococcus faecium*, isolates from all sources, Abu Dhabi 2024

Antibiotic	<i>Enterococcus faecium</i>			
	N=279			
	Isolates (N)	%R	I%	S%
Ampicillin	277	63.9	0.0	36.1
Gentamicin-High	264	20.8	5.0	74.2
Streptomycin-High	212	32.5	15.1	52.3
Levofloxacin	123	48.0	5.7	46.3
Linezolid	275	3.6	3.6	92.8
Vancomycin	275	16.4	0.0	83.6
Teicoplanin	154	9.1	1.3	83.6
Tigecycline ^a	275	3.6	3.6	92.8

^a Tigecycline: EUCAST breakpoints (S ≤0.25, R>0.25).

Figure 5.8.2: Annual trends for percentage of isolates resistant (%R) for *Enterococcus faecium*, Abu Dhabi, 2020-2024



Enterococcus faecium shows high resistance levels for ampicillin reached to 63.9% (2024) with fluctuating resistance of to gentamicin-HL and streptomycin-HL which are trending up. Resistance to fluoroquinolones is trending down from 63.2% in (2020) to 48.0% in (2024) for Levofloxacin.

5.9. *Candida spp.*

Table 5.9.1: Percentage of susceptible isolates for commonly reported *Candida spp.* from all sources, Abu Dhabi, 2024 (Cumulative antibiogram)

<i>Candida</i>	Isolates (N)	Triazoles		Polyenes	Echinocandins	
		FLU ^a	VOR ^b	AMB ^c	CAS ^d	MIF ^e
<i>C. albicans</i>	718	95.8	95.5	87	99.5	99.7
<i>C. auris</i>	187	1.3	74	42	87	93
<i>C. glabrata</i>	201	36.5	93.9	99.5	65.6	94.5
<i>C. tropicalis</i>	370	94	97.9	100	98.5	98.8
<i>C. parapsilosis</i>	223	87.5	93	96	99.5	99.4

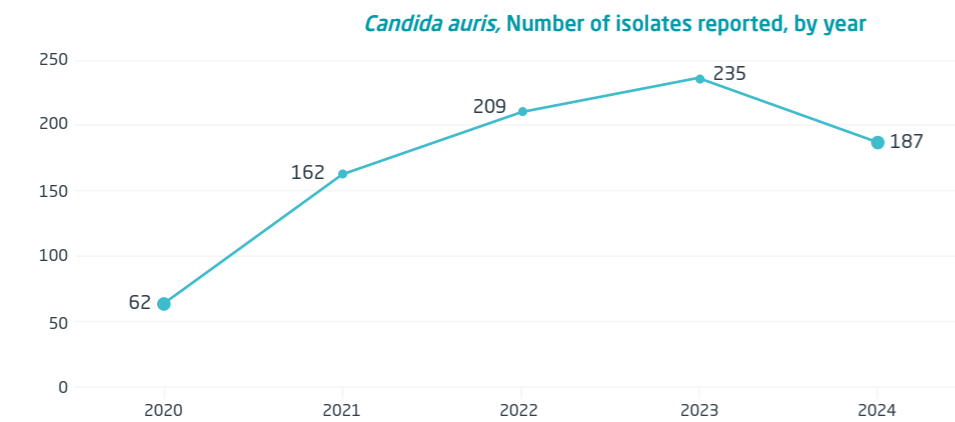
^aFLU=Fluconazole ^bVOR=Voriconazole ^cAMB=Amphotericin-B ^dCAS=Caspofungin ^eMIF=Micafungin
 • EUCAST breakpoints (S≤1, R>1) are used for amphotericin B for *C. albicans*, *C. glabrata*, *C. krusei*, *C. parapsilosis*, and *C. tropicalis* (EUCAST, 2024).
 • CDC tentative breakpoints for *Candida auris* (CDC *C. auris*, 2020)
 • NA= Not Applicable

Table 5.9.2: Percentages% of resistant, intermediate, and susceptible isolates for *Candida albicans* compared with *Candida auris* isolates from all sources, Abu Dhabi, 2024

Anti-fungal	<i>Candida albicans</i> N= 718				<i>Candida auris</i> N=187			
	Isolates (N)	%R	I%	S%	Isolates (N)	%R	I%	S%
Amphotericin B*	567.0	1	2	97	138	57	0.7	42
Caspofungin	665.0	0.3	0.2	99.5	122	10	2	88
Fluconazole	665.0	3	1	96	149	83	15	1
Micafungin	625.0	0	0	100	130	5	1	94
Voriconazole ^a	648.0	3	1	96	59	15	10	75

*Note: some automated systems overcall Amphotericin B resistance for *Candida auris*
^aFluconazole susceptibility are used as a surrogate for second generation triazole susceptibility assessment for *C. auris*. However, according to CDC isolates that are resistant to fluconazole may respond to other triazoles occasionally

Figure 5.9.1: *Candida auris*: Number of all de-duplicated isolates including positive screening, from all sources, by year



The number of reported isolates of *Candida auris* increased between 2020 and 2024 from N=62 to N=187.

5.10. *Mycobacterium tuberculosis*

Table 5.10: Percentages of resistant isolates for *Mycobacterium tuberculosis*, isolates from all sources, Abu Dhabi 2024 (Total number of isolates= 1,105)

Antibiotic	Isolates (N)	%R	I%	S%
Rifampin	1,101	1.9	0.0	98.1
Ethambutol	1,101	0.4	0.2	99.4
Isoniazid	1,100	5.8	1.7	92.5
Pyrazinamide	763	4.7	0.0	95.3
Streptomycin	231	2.6	0.0	97.4
Multidrug-resistant (INH+RIF)	1,048	1.7		

^aMRSA/MSSA is calculated as resistance/susceptibility to oxacillin: %MRSA = 12.9% and %MSSA = 86.9%.
^bTigecycline: EUCAST breakpoints (S≤0.5, R>0.5)
^cMultidrug resistance (MDR) was defined as isolates being either a known MRSA or having acquired non-susceptibility (NS) to at least one agent in three or more antimicrobial classes (Magiorakos, et al., 2012).

Figure 5.10.1: Percentages of resistant (%R) isolates for *Mycobacterium tuberculosis*, isolates from all sources, Abu Dhabi 2024 (Number of M. tuberculosis isolates =1,105)

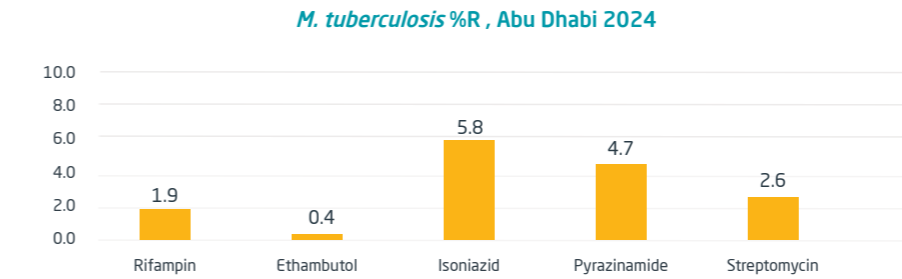
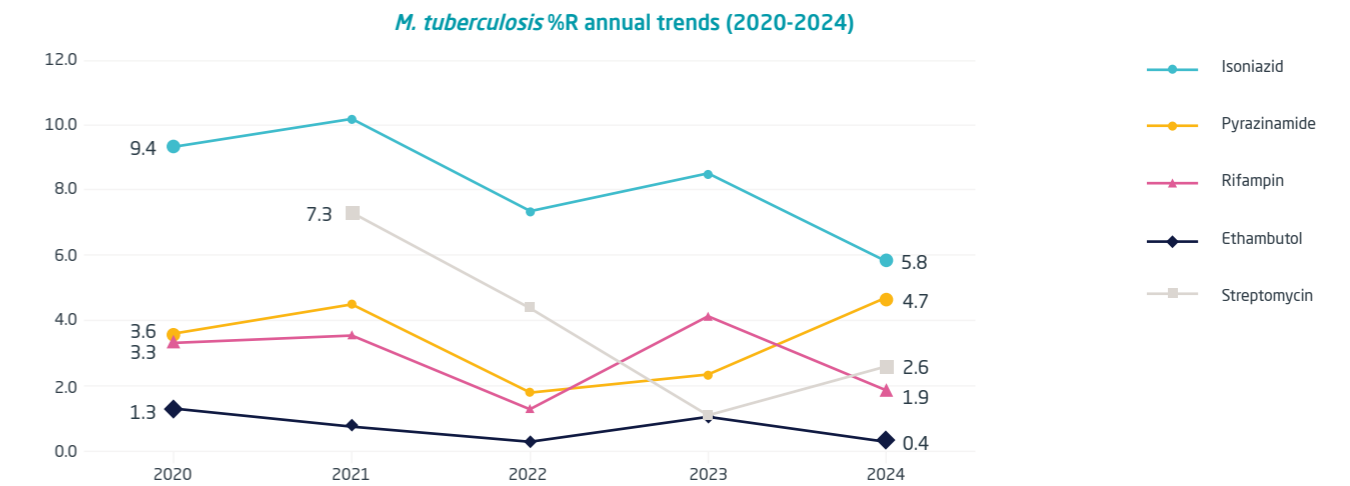


Figure 5.10.2: Annual Trends for percentage of isolates resistant (%R) for *Mycobacterium tuberculosis*, Abu Dhabi, 2020-2024



Resistance percentage of *M. tuberculosis* to first-line anti-TB medications ranged from 0.4% for ethambutol and streptomycin to 5.8% for isoniazid in 2024. Overall Isoniazid and Rifampin showed decreasing trend of resistance over period from 2020 to 2024, whereas Pyrazinamide resistance trend is slightly increasing from 3.6%R (2020) to 4.7%R (2024).

06

Summary Overview of AMR Trends in the Emirate of Abu Dhabi (2020-2024)

6.1. Gram-Negative Bacteria

Table 6.1: Antimicrobial resistance trends, Abu Dhabi, (2020-2024) of Gram-negative bacteria

Antibiotic Class/ Sub Class	<i>E. coli</i>	<i>Klebsiella pneumoniae</i>	<i>Pseudomonas aeruginosa</i>	<i>Salmonella spp (non-typhoid)</i>	<i>Acinetobacter baumannii</i>
Aminopenicillins (Ampicillin)	↑	NA	R	↓	R
Amoxicillin/Clavulanic Acid	↑	→	R	-	R
Piperacillin /Tazobactam	→/↑	↓	↑	↓	↓
3 rd /4 th generation cephalosporins	↑	↑	→/↓	<5% R	↓
Carbapenems (IMP/MEM)	≤1 %R	→/↓	↓	≤1 %R	↓
Fluoroquinolones (Ciprofloxacin)	→/↑	→/↑	→/↓	↑	↓
Aminoglycosides (Gentamicin)	→/↓	↓	NA	NA	↓
Trimethoprim/ Sulfamethoxazole (TMP/SMX)	↓	↓	R	↓	↓

↑/→/↓: decreasing/increasing/horizontal trend of percentage resistant isolates (%R), R: intrinsically resistant, N/A: Non-applicable.

Stable, resistance rate less than 1 percent (≤1% R), Less than 5 percent resistance (<5% R)

6.2. Gram-Positive Bacteria

Table 6.2: Antimicrobial resistance trends, Abu Dhabi, (2020-2024) of Gram-positive bacteria

Antibiotic Class/ Sub Class	<i>Staphylococcus aureus</i>	<i>Streptococcus pneumoniae</i>	<i>Enterococcus faecium</i>
Beta-lactam antibiotics	↑ (OXA)	→/↓ (CRO)	↓ (AMP)
Macrolides (Erythromycin)	↑	↑	N/A
Lincosamides (Clindamycin)	↑	↑	N/A
Aminoglycosides (Gentamicin)	↑	N/A	↓ (GEN-HL)
Fluoroquinolones (Levo/Moxi)	→/↓	↑	↓
Glycopeptides (Vancomycin)	≤1 %R	≤1 %R	↑
Trimethoprim/sulfamethoxazole	↓	↑	R

↑/→/↓: Increasing/decreasing/stable trends.

OXA: Oxacillin, PEN: Penicillin, CRO: Ceftriaxone (non-meningitis breakpoints), AMP: Ampicillin, GEN-HL: Gentamicin- High

N/A: Non-applicable, R: Intrinsically resistant

07

Cumulative Antibiogram



7.1. Table: Gram-Negative Cumulative Antibiogram for the Emirate of Abu Dhabi (2024)

Percent susceptible isolates (%S^a)

Gram-negative Bacteria	Isolates N	β-Lactams											Aminoglycosides			FQ	Other		
		Penicillins				Cephalosporins			Carbapenems				AMK	GEN	TOB	CIP	ATM	SXT	NIT ^b
		AMP	AMC	TZP	CZO	CXM	CTX	CAZ	FEP	IPM	MEM	ETP	AMK	GEN	TOB	CIP	ATM	SXT	NIT ^b
Gram-negative bacteria (all)	60,359	-	68	90	-	-	71	-	82	92	97	99	94	90	87	68	71	73	77 ^b
<i>Haemophilus influenzae</i> ^c	1,153	68	93	-	-	86	-	-	-	-	-	-	-	-	-	90	-	61	-
<i>Moraxella (catarrhalis)</i> ^d	439	-	100	-	-	-	-	-	-	-	-	-	-	-	-	89	-	95	-
Enterobacterales (all)	47,662	24	70	91	44	-	70	-	81	94	99	99	94	90	85	64	72	72	77 ^b
<i>Citrobacter koseri</i>	1,285	R	93	92	86	78/80 ⁱ	91	-	96	97	99	100	96	99	99	96	-	96	78 ^b
<i>Enterobacter cloacae</i>	1,077	R	R	85	R	23/26 ⁱ	82	-	91	91	98	97	98	95	90	82	-	87	54 ^b
<i>Enterobacter aerogenes</i>	1,113	R	R	85	R	R	80	-	95	76	98	99	99	97	96	90	-	94	28 ^b
<i>Escherichia coli</i> ^e	26,841	34	75	93	46	60/57 ⁱ	65	-	75	99	99	99	96	90	86	55	77	65	96 ^b
<i>Klebsiella pneumoniae</i>	11,258	R	79	86	59	69/69 ⁱ	77	-	86	95	98	98	97	95	85	74	70	81	37 ^b
<i>Klebsiella oxytoca</i>	522	R	77	91	-	73/73 ⁱ	94	-	89	93	97	97	95	94	86	82	-	84	78 ^b
<i>Morganella morganii</i>	621	R	R	95	R	R	79	-	97	23	99	99	96	86	90	56	-	70	R
<i>Proteus mirabilis</i>	1,205	57	82	98	71	83/83 ⁱ	85	-	91	20	97	94	90	69	77	65	-	64	R
<i>Salmonella spp. (Non-typhoid)</i>	1,007	85	97	-	-	-	96	-	99	-	-	-	-	-	-	80 ^f	-	97	R
<i>Salmonella spp. (Typhi, Paratyphi)</i>	213	76	93	-	-	40/40 ⁱ	78	-	82	-	-	-	-	-	-	17	-	86	-
<i>Serratia marcescens</i>	1,341	R	R	87	R	R	91	-	96	86	98	98	96	93	82	87	-	98	R
Non-fermenting gram neg. rods	8,712	R	R	90	-	-	-	85	87	84	86	R	793	89	90	85	-	81	-
<i>Acinetobacter baumannii</i>	569	R	R	91	-	-	-	90	93	95	95	R	793	95	94	87	R	95	-
<i>Pseudomonas aeruginosa</i>	6,390	R	R	91	-	R	R	86	89	83	86	R	96 ^g	-	94	86	69	R	R
<i>Stenotrophomonas maltophilia</i> ^h	636	R	R	R	-	-	R	-	R	R	R	R	R	R	R	-	R	95	-

^aThe %S for each organism/antimicrobial combination was generated by including the first isolate only of that organism encountered on a given patient during 2024 (de-duplicated data). ^bNIT: Nitrofurantoin data from urine isolates only. ^c*H. influenzae*: disc diffusion data (KB): LVX 95 %S, CRO 97 %S, AZM 87 %S, TCY: 71%S, CLR: no data. ^d*M. catarrhalis*: CLR: no data, ERY 84 %S, AZM 87%S, LVX: 89%, TCY 98 %S. ^e*E. coli* (urinary tract isolates): FOS 96 %S. ^fCiprofloxacin results for *Salmonella spp.* (non-typhoid) refer to extra-intestinal (non-stool) isolates only. ^gAmikacin should only be used for *Pseudomonas aeruginosa* Urinary Tract Infection (UTI). ^h*S. maltophilia*: MNO 91 % S, LVX 86 % S. ⁱCefuroxime: oral/parenteral breakpoints. **AMC**=Amoxicillin/Clavulanic acid, **AMK**=Amikacin, **AMP**=Ampicillin, **ATM**=Aztreonam, **AZM**=Azithromycin, **CAZ**=Ceftazidime, **CIP**=Ciprofloxacin, **CLR**=Clarithromycin, **CRO**=Ceftriaxone, **CTX**=Cefotaxime, **CXM**=Cefuroxime, **CZO**=Cefazolin, **ETP**=Ertapenem, **ERY**=Erythromycin, **FEP**=Cefepime, **FOS**=Fosfomicin, **GEN**=Gentamicin, **IPM**=Imipenem, **LVX**=Levofloxacin, **MEM**=Meropenem, **MNO**=Minocycline, **NIT**=Nitrofurantoin, **SXT**=Trimethoprim/Sulfamethoxazole, **TCC**=Ticarcillin/Clavulanic acid, **TCY**=Tetracycline, **TOB**=Tobramycin, **TZP**=Piperacillin/Tazobactam. %S=Percent of isolates susceptible, **FQ**=Fluoroquinolones, **MIC**=Minimal inhibitory concentration data only, unless mentioned otherwise (usually derived by antibiotic susceptibility testing platforms), except for *H. influenzae* and *M. catarrhalis* (disc diffusion data), **N**=Number, *spp.*=species, **R**=intrinsically resistant, (-) =No data available, small number of isolates tested (N<30), antimicrobial agent is not indicated, or not effective clinically. Interpretation standard: CLSI M100 ED34:2024. Presentation standard: CLSI M39-ED5:2022. Data analysis: WHONET 2024

7.2. Table: Gram-Positive Cumulative Antibigram for the Emirate of Abu Dhabi (2024)

Percent susceptible isolates (%S^a)

Gram-negative Bacteria	Isolates	β-Lactams						Macrolides		Aminoglycosides			FQ		Glycopept		Other					
		N	AMP	PEN	AMC	OXA	CRO	CTX	ERY	CLI	GEN	GEH	STH	LVX	MFX	VAN	TEC	SXT	NIT ^b	LNZ	TCY	RIF
Gram-positive bacteria (all)	39,994	-	-	-	-	-	-	46	61	-	?	?	78	67	99	98	75	97	99	-	-	-
<i>Enterococcus spp.</i>	4564	94	-	-	-	R	R	-	R	R	82	75	73	-	97	99	R	95	98	-	-	-
<i>Enterococcus faecalis</i>	3977	99	99	-	-	R	R	17	R	R	82	78	75	-	99	99	R	98	99	25	-	R
<i>Enterococcus faecium</i>	305	36	-	-	-	R	R	-	R	R	74	52.3	46	-	84	90	R	45	93	33	-	81
<i>Staphylococcus aureus</i>	13,082			61 ^c	61	-	-	58	78	88	-	-	70	67	100	100	78	99	100	86	98	82
MSSA+	6641	-	-	100	100	-	-	63	83	96	-	-	79	79	100	100	82	100	100	90	99	85
MRSA ^j	4265	-	-	-	-	-	-	51	71	75	-	-	56	56	100	100	77	99	100	80	99	75
<i>Coagulase-neg. staphylococci (CNS)</i>	1546	-	-	47 ^c	47	-	-	48	71	84			80	60	100	93	86	93	99	75	96	100
<i>Staphylococcus epidermidis</i>	1354			37 ^c	37	-	-	27	59	60	-	-	72	54	99	85	72	-	99	77	96	94
<i>Staphylococcus saprophyticus</i>	707			21 ^c	21	-	-	45	76	99	-	-	98	73	98	94	86	100	98	93	99	88
<i>Staphylococcus lugdunensis</i> ^g	176	-	-	70 ^c	70	-	-	70	72	90	-	-	96	80	100	99	93	100	100	89	100	83
<i>Streptococcus pneumoniae</i>	1574	-	86 ^d	-	-	98 ^e	92 ^e	41	63	-	-	-	92	99	100	-	60	-	100	45	99	99
<i>Streptococcus pyogenes</i> ^h	1,792	99 ^f	99	-	-	99	97	57	72	-	-	-	85	99	99	-	-	-	99	76	-	-
<i>Streptococcus agalactiae</i> ⁱ	8,306	99 ^f	99	-	-	99	97	57	72	-	-	-	85	99	99	-	-	-	99	76	-	-
<i>Streptococcus spp. (Viridans group)</i>	931	97	68	-	-	91	86	48	74	-	-	-	82	-	99	-	-	-	99	62	-	-

^a The %S for each organism/antimicrobial combination was generated by including the first isolate only of that organism encountered on a given patient during 2024 (de-duplicated data). ^b NIT: Nitrofurantoin data from testing urine isolates only. ^c Extrapolated, based on Oxacillin. ^d Data shown is based on non-meningitis breakpoints for Pen G. ^e CRO/CTX: Data shown is based on non-meningitis breakpoints. ^f Extrapolated, based on Penicillin G. ^g includes *ss bovis* and *ss saprophyticus*. ^h includes *Streptococcus*, beta-haemolytic group A (GAS). ⁱ includes *Streptococcus*, group B (GBS). Excludes GBS isolates from vagina. ^j *S. aureus*: excludes isolates from axilla, nose, groin, perineum, and umbilicus. MIC=Minimal inhibitory concentration data only, except GEN % S for *Staphylococcus epidermidis*. AMP=Ampicillin, AMC=Amoxicillin/Clavulanic acid, CLI=Clindamycin, CRO=Ceftriaxone, CTX=Cefotaxime, ERY=Erythromycin, GEH=Gentamicin, high-level, GEN=Gentamicin, LNZ=Linezolid, LVX=Levofloxacin, MFX=Moxi-floxacin, NIT=Nitrofurantoin, OXA=Oxacillin, PEN=Penicillin G, QDA=Quinupristin/Dalfopristin, RIF=Rifampin, STH=Streptomycin, high-level, SXT=Trimethoprim/Sulfamethoxazole, TEC=Teicoplanin, TCY=Tetracycline, VAN=Vancomycin. %S=Percent of isolates susceptible, FQ=Fluoroquinolones, GAS=Group A streptococci, GBS=Group B streptococci, Glycopept.=Glycopeptides, MIC=Minimal inhibitory concentration data only, unless mentioned otherwise (usually derived by antibiotic susceptibility testing platforms), MRSA=Oxacillin-resistant *S. aureus*, MSSA=Oxacillin-susceptible *S. aureus*, N=Number, spp.=species, R=intrinsically resistant, (-) =No data available, or small number of isolates tested (N<30), or antimicrobial agent is not indicated or not effective clinically. Interpretation standard: CLSI M100 ED34:2024. Presentation standard: CLSI M39-A4:2022. Data analysis: WHONET 2024. Data source: AMR Surveillance, Abu Dhabi, United Arab Emirates

08

Summary and Recommendations

08 | Summary and Recommendations

This antimicrobial resistance report specifically tailored for the Emirate of Abu Dhabi provides valuable insights into the current state of AMR and offers targeted recommendations for improving patient care, infection control, and antimicrobial stewardship.

In summary:

The reported Antimicrobial Resistance (AMR) data in Abu Dhabi can be summarized as follows:

- Antimicrobial Resistance is (overall) high and/or increasing slightly in Abu Dhabi Emirate mainly for *Staph. aureus* (MRSA), and ESBL *K. pneumoniae*.
- However, the AMR trends overall are considered low and/or stable/decreasing in Abu Dhabi Emirate for MDR *Acinetobacter*, MDR *P. aeruginosa*, VRE, and MDR TB.
- The number of reported isolates of *Candida auris* is overall increasing in the Emirate of Abu Dhabi with a minor reduction during 2024, with isolates frequently being resistant to Fluconazole.

Recommendations:

1. Scale up infection prevention and control by implementing and enforcing rigorous measures to minimize the transmission of resistant pathogens. This includes proper hand hygiene, sterilization practices, update IPC policies according to international guidelines, adherence to infection control protocols along with vaccination and public health measures.
2. Promoting antimicrobial stewardship by ensuring appropriate antimicrobial usage through following guidelines and DOH policies and standards. The use of reported cumulative antibiograms in this report is highly encouraged to develop local antibiograms and treatment guidelines that can be used for clinical practice purposes.
3. Healthcare workers and antimicrobial prescribers are encouraged to enhance public awareness regarding optimal antimicrobial use and resistance through patients' education about the responsible use of antibiotics and potential side effects.
4. Interfacing the AST machines to lab-information system (LIS) and health-information system (HIS) are highly advised to all participating facilities for optimal data extraction.
5. To improve standardization of data collection and processing, it is highly recommended to complying with the Standard for Monitoring and Reporting of Antimicrobial Resistance (AMR) (Reference: DOH/HSED/ST/0017-002/HS_EHSMS/ V 2), which was released by Department of Health-Abu Dhabi in March 2024.
6. The AMR surveillance system currently monitors pathogens with data obtained by phenotypic testing however the application of whole genomic sequencing (WGS) for AMR surveillance should be considered as it can provide further key information on emerging and spread of resistance patterns.
7. To direct resources towards investment in research innovation and access to effective antibiotics, diagnostics and treatment.

Annexes:

Annex (1): Data Fields Collected for AMR Surveillance

Nr.	Data Field	Description	Format	Classification
1	PATIENT_ID	Patient ID (medical record number)	Required	TEXT
2	PATIENT_EID	Patient Emirates ID nr.	Desirable	TEXT
3	PATIENT_NAME	Patient name	Desirable	TEXT
4	PATIENT_DOB	Patient date of birth (DOB)	Required	DATE (dd/mm/yyyy)
5	PATIENT_AGE	Patient age	Required	NUMERICAL
6	PATIENT_GENDER	Patient gender	Optional	TEXT
7	PATIENT_NATIONALITY	Patient nationality	Desirable	TEXT
8	PATIENT_NAT_STATUS	Patient nationality status	Desirable	TEXT
9	PATIENT_ADM_DATE	Date of patient admission	Required	DATE (dd/mm/yyyy)
10	PATIENT_DISC_DATE	Date of discharge (for inpatients)	Desirable	DATE (dd/mm/yyyy)
11	FACILITY_NAME	Healthcare facility name	Required	TEXT
12	FACILITY_ID	Healthcare facility ID	Optional	TEXT
13	FACILITY_LICENCE_NR	Healthcare facility licensing number	Required	TEXT
14	FACILITY_EMIRATE	Healthcare facility Emirate	Conditional	TEXT
15	FACILITY_DEPT_NAME	Department/specialty name	Required	TEXT
16	PATIENT_LOCATION_NAME	Patient location name	Required	TEXT
17	PATIENT_LOCATION_TYPE	Patient location type	Desirable	TEXT
18	LAB_NAME	Laboratory name	Required	TEXT
19	SPECIMEN_PROC_ORDER_NAME	Microbiological procedure ordered	Required	TEXT
20	SPECIMEN_LAB_NR	Specimen lab number	Required	TEXT
21	SPECIMEN_TYPE	Specimen type	Required	TEXT
22	SPECIMEN_DATE_COLLECTED	Specimen collection date	Required	DATE (dd/mm/yyyy)
23	ORGANISM_NAME	Name of identified organism	Required	TEXT
24	AST_METHOD	AST susceptibility Method	Conditional	TEXT
25	AST_RESULT_CAT	AST result (categorical/interpreted)	Required	TEXT
26	AST_RESULT_NUM	AST result (numerical)	Required	TEXT
27	ANTIBIOTIC_NAME	Antimicrobial agent tested	Required	TEXT
28	PATIENT_DISC_STATUS	Patient discharge status	Desirable	TEXT
29	DIAGNOSIS	Diagnosis	Desirable	TEXT

Annex (2): AMR Surveillance sites in the Emirate of Abu Dhabi

Nr.	Facility Name	Region	Type/Ownership
1	Ain Al Khaleej Hospital	Al Ain	Hospital (private)
2	Al Ain hospital	Al Ain	Hospital (public)
3	Al Bahla Healthcare Center	Abu Dhabi	Center/Clinic (public)
4	Al Bateen Healthcare Center	Abu Dhabi	Center/Clinic (public)
5	Al Dhafra Family Medicine Center	Al Dhafra	Center/Clinic (public)
6	Al Dhafra hospitals - Delma island hospital	Al Dhafra	Hospital (public)
7	Al Dhafra hospitals - Gayathi hospital	Al Dhafra	Hospital (public)
8	Al Dhafra hospitals - Liwa hospital	Al Dhafra	Hospital (public)
9	Al Dhafra hospitals - Madinat Zayed hospital	Al Dhafra	Hospital (public)
10	Al Dhafra hospitals - Mirfa hospital	Al Dhafra	Hospital (public)
11	Al Dhafra hospitals - Silla hospital	Al Dhafra	Hospital (public)
12	Al Ettihad Health Center	Abu Dhabi	Center/Clinic (public)
13	Al Falah Healthcare Center	Abu Dhabi	Center/Clinic (public)
14	Al Faqah Health Center	Al Ain	Center/Clinic (public)
15	Al Hayar Healthcare Center	Al Ain	Center/Clinic (public)
16	Al Hili Healthcare Center	Al Ain	Center/Clinic (public)
17	Al Jahili Healthcare Center	Al Ain	Center/Clinic (public)
18	Al Khaleej Primary Health Center	Abu Dhabi	Center/Clinic (public)
19	Al Khatim Healthcare Center	Abu Dhabi	Center/Clinic (public)
20	Al Khazna Healthcare Center	Al Ain	Center/Clinic (public)
21	Al Madina Occupational Health Center	Abu Dhabi	Center/Clinic (public)
22	Al Manhal Primary Health Center	Abu Dhabi	Center/Clinic (public)
23	Al Maqam Healthcare Center	Al Ain	Center/Clinic (public)
24	Al Maqtaa Healthcare Center	Abu Dhabi	Center/Clinic (public)
25	Al Mushrif Children's Speciality Center	Abu Dhabi	Center/Clinic (public)
26	Al Muwaeji Healthcare Center	Al Ain	Center/Clinic (public)
27	Al Nahda Healthcare Center	Abu Dhabi	Center/Clinic (public)
28	Al Niyadat Healthcare Center	Al Ain	Center/Clinic (public)
29	Al Quaa Healthcare Center	Al Ain	Center/Clinic (public)
30	Al Rahba hospital	Abu Dhabi	Hospital (public)
31	Al Remah Healthcare Center	Al Ain	Center/Clinic (public)
32	Al Rowdha Healthcare Center	Abu Dhabi	Center/Clinic (public)
33	Al Samha Healthcare Center	Abu Dhabi	Center/Clinic (public)
34	Al Shamkha Healthcare Center	Abu Dhabi	Center/Clinic (public)
35	Al Shwaib Healthcare Center	Al Ain	Center/Clinic (public)
36	Al Towayya Healthcare Center	Al Ain	Center/Clinic (public)
37	Al Yahar Healthcare Center	Al Ain	Center/Clinic (public)
38	Al Zafrana Healthcare Center	Abu Dhabi	Center/Clinic (public)
39	American Surge Center	Abu Dhabi	Center/Clinic (private)
40	Baniyas Healthcare Center	Abu Dhabi	Center/Clinic (public)
41	Bida Mutawa Clinics	Al Dhafra	Center/Clinic (public)
42	Cleveland Clinic Abu Dhabi	Abu Dhabi	Hospital (public)
43	Corniche hospital	Abu Dhabi	Hospital (public)
44	Cosmesurge Al Ain Clinic	Al Ain	Center/Clinic (private)
45	Cosmesurge and NMC Clinic Delma Street	Abu Dhabi	Center/Clinic (private)
46	Cosmesurge BAS Clinic	Abu Dhabi	Center/Clinic (private)
47	Cosmesurge Conrad Clinic	Abu Dhabi	Center/Clinic (private)
48	Cosmesurge Khalifa Clinic	Abu Dhabi	Center/Clinic (private)
49	Cosmesurge Zakher Al Ain Clinic	Al Ain	Center/Clinic (private)
50	Cure Plus Medical Center	Al Ain	Center/Clinic (private)
51	Danat Al Emarat Clinic for Women and Children	Abu Dhabi	Center/Clinic (private)
52	Danat Al Emarat Hospital	Abu Dhabi	Hospital (private)

Nr.	Facility Name	Region	Type/Ownership
53	Emirates International Hospital Al Ain	Al Ain	Hospital (private)
54	Health Management System (HMS) Abu Dhabi Center (DPSC)	Abu Dhabi	Center/Clinic (public)
55	Health Management System (HMS) Al Ain Center (DPSC)	Al Ain	Center/Clinic (public)
56	Health Plus Diabetes and Endocrinology Center	Abu Dhabi	Center/Clinic (private)
57	Health Plus Family Health Center - Al Bandar	Abu Dhabi	Center/Clinic (private)
58	Health Plus Family Health Center - Al Forsan	Abu Dhabi	Center/Clinic (private)
59	Health Plus Fertility and Women's Health Center - Al Karama area	Abu Dhabi	Center/Clinic (private)
60	Healthpoint Hospital	Abu Dhabi	Hospital (private)
61	Health Sheild Medical Center	Abu Dhabi	Center/Clinic (private)
62	IMA - Golden Health Mobile Medical Unit	Abu Dhabi	Center/Clinic (private)
63	IMA - Sehaty Medical Center	Abu Dhabi	Center/Clinic (private)
64	Imperial College London Diabetes Center Abu Dhabi	Abu Dhabi	Center/Clinic (private)
65	Imperial College London Diabetes Center Al Ain	Al Ain	Center/Clinic (private)
66	Imperial College London Diabetes Center Zayed Sports City Branch	Abu Dhabi	Center/Clinic (private)
67	Madinat Khalifa Healthcare Center	Abu Dhabi	Center/Clinic (public)
68	Madinat Mohamed Bin Zayed Healthcare Center	Abu Dhabi	Center/Clinic (public)
69	Mafraq hospital	Abu Dhabi	Hospital (public)
70	Mediclinic Airport Road Hospital	Abu Dhabi	Hospital (private)
71	Mediclinic Al Ain hospital	Al Ain	Hospital (private)
72	Mediclinic Al Bateen	Abu Dhabi	Center/Clinic (private)
73	Mediclinic Al Bawadi	Al Ain	Center/Clinic (private)
74	Mediclinic Al Jowhara Hospital	Al Ain	Hospital (private)
75	Mediclinic Al Madar	Al Ain	Center/Clinic (private)
76	Mediclinic Al Marmoura	Abu Dhabi	Center/Clinic (private)
77	Mediclinic Al Mussafah	Abu Dhabi	Center/Clinic (private)
78	Mediclinic Al Noor Hospital Abu Dhabi	Abu Dhabi	Hospital (private)
79	Mediclinic Al Yahar	Al Ain	Center/Clinic (private)
80	Mediclinic Baniyas	Abu Dhabi	Center/Clinic (private)
81	Mediclinic ENEC	Al Dhafra	Center/Clinic (private)
82	Mediclinic Gayathi	Al Dhafra	Center/Clinic (private)
83	Mediclinic Khalifa City A	Abu Dhabi	Center/Clinic (private)
84	Mediclinic Madinat Zayed	Al Dhafra	Center/Clinic (private)
85	Mediclinic Zakher	Al Ain	Center/Clinic (private)
86	Mezyad Healthcare Center	Al Ain	Center/Clinic (public)
87	Moorfields Eye Hospital Center - Al Marina	Abu Dhabi	Center/Clinic (private)
88	Neima Healthcare Center	Al Ain	Center/Clinic (public)
89	NMC ADNOC OHC	Abu Dhabi	Center/Clinic (private)
90	NMC Alpha Medical Center, Abu Dhabi	Abu Dhabi	Center/Clinic (private)
91	NMC Family Medical Center (Al Bateen)	Abu Dhabi	Center/Clinic (private)
92	NMC Golden Sands Medical Center	Abu Dhabi	Center/Clinic (private)
93	NMC Karama Medical Center	Abu Dhabi	Center/Clinic (private)
94	NMC Medical Center Al Wadi	Al Ain	Center/Clinic (private)
95	NMC Medical Centre Mohammed Bin Zayed	Abu Dhabi	Center/Clinic (private)
96	NMC Medical Specialty Medical Center, Khalidiya, Abu Dhabi	Abu Dhabi	Center/Clinic (private)
97	NMC Mesk AlMadina Medical Centre LLC	Abu Dhabi	Center/Clinic (private)
98	NMC Oxford Medical Center, Abu Dhabi	Abu Dhabi	Center/Clinic (private)
99	NMC Provita International Medical Center Abu Dhabi	Abu Dhabi	Center/Clinic (private)
100	NMC Provita International Medical Center Al Ain	Al Ain	Center/Clinic (private)
101	NMC Royal Family Medical Center (Al Mussafah)	Abu Dhabi	Center/Clinic (private)
102	NMC Royal hospital Khalifa City A	Abu Dhabi	Hospital (private)
103	NMC Royal Medical Center Sama Tower Abu Dhabi	Abu Dhabi	Center/Clinic (private)
104	NMC Royal women's Hospital Abu Dhabi	Abu Dhabi	Hospital (private)
105	NMC Shahama Medical Center	Abu Dhabi	Center/Clinic (private)
106	NMC Specialty Hospital Abu Dhabi	Abu Dhabi	Hospital (private)

Nr.	Facility Name	Region	Type/Ownership
107	NMC Specialty Hospital Al Ain	Al Ain	Hospital (private)
108	NMC UAE University Clinics	Al Ain	Center/Clinic (private)
109	Oud Al Touba Healthcare Center	Al Ain	Center/Clinic (public)
110	SEHA Kidney Care Center - Abu Dhabi	Abu Dhabi	Center/Clinic (public)
111	SEHA Kidney Care Center - Al Ain	Al Ain	Center/Clinic (public)
112	SEHA Kidney Care Center - Central	Abu Dhabi	Center/Clinic (public)
113	Sheikh Khalifa Medical City	Abu Dhabi	Hospital (public)
114	Sheikh Shakhbout Medical City	Abu Dhabi	Hospital (public)
115	Sheikh Tahnoon Bin Mohammad Medical City	Abu Dhabi	Hospital (public)
116	Sheikh Zayed Mosque Clinic	Abu Dhabi	Center/Clinic (private)
117	Specialized Rehabilitation Hospital	Abu Dhabi	Hospital (Private)
118	Sir Baniyas Clinic	Al Dhafra	Center/Clinic (public)
119	Sweihan Healthcare Center	Al Ain	Center/Clinic (public)
120	Tawam Al Wagan hospital	Al Ain	Hospital (public)
121	Tawam hospital	Al Ain	Hospital (public)
122	VPS Burjeel Day Surgery Center, Al Reem island	Abu Dhabi	Center/Clinic (private)
123	VPS Burjeel Farha Hospital Al Ain	Al Ain	Hospital (private)
124	VPS Burjeel Hospital Abu Dhabi	Abu Dhabi	Hospital (private)
125	VPS Burjeel Medical Center, Al Zeina	Abu Dhabi	Center/Clinic (private)
126	VPS Burjeel Medical Center, Barari Mall Al Ain	Al Ain	Center/Clinic (private)
127	VPS Burjeel Medical Center, Shahama	Abu Dhabi	Center/Clinic (private)
128	VPS Burjeel Medical Center, Shamkha	Abu Dhabi	Center/Clinic (private)
129	VPS Burjeel Medical Center, Yas Mall	Abu Dhabi	Center/Clinic (private)
130	VPS Burjeel Medical City Abu Dhabi	Abu Dhabi	Hospital (private)
131	VPS Burjeel MHPC Marina Medical Center	Abu Dhabi	Center/Clinic (private)
132	VPS Burjeel Oasis Medical Center	Al Dhafra	Center/Clinic (private)
133	VPS Burjeel Royal Hospital Al Ain	Al Ain	Hospital (private)
134	VPS Burjeel Tajmeel Kid's Park Medical Center	Abu Dhabi	Center/Clinic (private)
135	VPS Lifecare Hospital Baniyas	Abu Dhabi	Hospital (private)
136	VPS Lifecare Hospital Musaffah	Abu Dhabi	Hospital (private)
137	VPS Lifecare Razeen Medical Center	Abu Dhabi	Center/Clinic (private)
138	VPS Lifeline Medical Center	Abu Dhabi	Center/Clinic (private)
139	VPS LLH Hospital Abu Dhabi	Abu Dhabi	Hospital (private)
140	VPS LLH Hospital Musaffah	Abu Dhabi	Hospital (private)
141	VPS LLH Medical Centre (Shabiya 11)	Abu Dhabi	Center/Clinic (private)
142	VPS Medeor 24x7 Hospital Abu Dhabi	Abu Dhabi	Hospital (private)
143	VPS Occupational Medicine Center Musaffah	Abu Dhabi	Center/Clinic (private)
144	Wahat Al Aman Home Healthcare LLC Abu Dhabi	Abu Dhabi	Home Healthcare
145	Wahat Al Aman Home Healthcare LLC Al Ain	Al Ain	Home Healthcare
146	Zhaker Healthcare Center	Al Ain	Center/Clinic (public)

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