Report on

Antimicrobial Resistant Surveillance Bangladesh, 2024

Sectoral Co-ordination center (Human Health) and
National Reference Laboratory (NRL) for AMR Surveillance
Institute of Epidemiology, Disease Control & Research (IEDCR)
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Cover Design & Publisher:

Response Limited

Date of Publishing: November 2024

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Acknowledgement

- Communicable Disease Control Program (CDC), DGHS
- Directorate General of Drug Administration (DGDA)
- Department of Livestock Services (DLS)
- Bangladesh Livestock Research Institute (BLRI)
- World Health Organization, Bangladesh
- Centers for Disease Control and Prevention, Atlanta, USA (US-CDC)
- Fleming Fund Country Grant to Bangladesh
- Fleming Fund Regional Grant
- Surveillance physicians, nurses, laboratory personnel and Project facilitators of all the Surveillance Sites of AMR Surveillance in Bangladesh
- All the private and public laboratories participating in laboratory-based surveillance of AMR Surveillance
- All the patients from whom the samples and data has been collected

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Abbreviations

3GCRE	:	Third-generation cephalosporin-resistant Enterobacterales
AHRD	:	Animal Health Research Division
AMC	:	Antimicrobial Consumption
AMR	:	Antimicrobial resistance
AMU	:	Antimicrobial Use
AqH	:	Aquatic Health
ARC	:	Antimicrobial Resistance Containment
AST	:	Antimicrobial susceptibility testing
BAHIS	:	Bangladesh Animal Health Intelligence System
BLRI	:	Bangladesh Livestock Research Institute
BSL	:	Biosafety Level
CAPTURA	:	Capturing Data on AMR Patterns and Trends in Use in Regions of Asia
CCU	:	Coronary Care Unit
CDC	:	Communicable Disease Control
CDIL	:	Central Disease Investigation Laboratory
CLSI	:	Clinical & Laboratory Standards Institute
CoNS	:	Coagulase negative Staphylococci
CRE	:	Carbapenem-Resistant Enterobacterales
CRPA	:	Carbapenem Resistant Pseudomonas aeruginosa
DGDA	:	Directorate General of Drug Administration
DGHS	:	Directorate General of Health Services
DLS	:	Department of Livestock Services
DVH	:	District Veterinary Hospital
EQA	:	External Quality Assurance
ESBL	:	Extended-spectrum beta-lactamase
FAO	:	Food and Agriculture Organization of the United Nations
FDIL	:	Field Disease Investigation Laboratory
FIQCL	:	Fish Inspection and Quality Control Laboratory
GHSA	:	Global Health Security Agenda
GLASS	:	Global Antimicrobial Resistance Surveillance System
GLG	:	Global Leaders Group
HAI	:	Hospital Acquired Infection
HDU	:	High Dependency Unit
HPNSP	:	Health, Population and Nutrition Sector program
ICU	:	Intensive Care Unit
IEDCR	:	Institute of Epidemiology Disease Control and Research
IPC	:	Infection Prevention and Control
IPDIPC	:	In Patient Department
IQAIPC	:	Internal Quality Assurance
IQCIPC	:	Internal Quality Control

MDR	:	Multidrug resistance
MoFL	:	Ministry of Fisheries and Livestock
MoHFW	:	Ministry of Health and Family Welfare
MRSA	:	Methicillin resistant Staphylococcus aureus
NAP	:	National Action Plan
NCC	:	National Coordination Center
NIC	:	National Influenza Centre
NRL	:	National Reference Laboratory
OIE	:	Organization for Animal Health WOAH
OPD	:	Outpatient Department
ORT	:	Oral Rehydration Therapy
PCR	:	Polymerase Chain Reaction
PDR	:	Pan drug resistance
PICU	:	Pediatric Intensive Care Unit
PPS	:	Point Prevalence Survey
PRTC	:	Poultry Research and Training Center
QC	:	Quality Control
QJS	:	Quadripartite Joint Secretariat
RT-PCR	:	Real Time Polymerase Chain Reaction
SCC	:	Sectoral Coordination Center
SDG	:	Sustainable Development Goals
SOP	:	Standard Operating Procedure
SCANU	:	Special Care Newborn Unit
UNEP	:	United Nations Environment Programme
UNGA	:	United Nations General Assembly
UTI	:	Urinary Tract Infection
VH	:	Viral Hepatitis
VRE	:	Vancomycin resistant Enterococci
VRSA	:	Vancomycin resistant Staphylococcus aureus
WHA	:	World Health Assembly
WHO	:	World Health Organization
WOAH	:	World Organization of Animal Health formerly the Office International des Epizooties (OIE)
XDR	:	Extensively drug- resistant

Definitions

MDR (Multidrug resistance): MDR is defined as non-susceptibility to at least one antimicrobial agent in three or more antimicrobial categories

XDR (Extensively drug resistance): XDR is defined as non-susceptibility to at least one agent in all but two or fewer antimicrobial categories (i.e., bacterial isolates remain susceptible to only one or two categories)

PDR (Pandrug resistance): PDR is defined as non-susceptibility to all agents in all antimicrobial categories (i.e., no agents tested as susceptible for that organism)

MRSA (Methicillin-resistant *Staphylococcus aureus*): Strains of *Staphylococcus aureus* that are resistant to penicillinase-resistant penicillin such as oxacillin, methicillin, cloxacillin, and nafcillin. These strains are resistant to all beta-lactam antibiotics, including cephalosporins and carbapenems.

VRE (Vancomycin-resistant Enterococci): Strains of Enterococcus bacteria that have developed resistance to the antibiotic vancomycin, which is often used to treat serious infections."
These bacteria are typically found in the gastrointestinal tract and can cause severe infections, especially in healthcare settings. The resistance to vancomycin is often due to genetic mutations that alter the target site of the antibiotic, rendering it ineffective.

CRE (Carbapenem-resistant Enterobacteriaceae): A family of Gram-negative bacteria that are resistant to carbapenem antibiotics, which are often considered the last line of defense against bacterial infections. The resistance mechanism in CRE is primarily due to the production of carbapenemase enzymes, which break down the antibiotic.

Antibiogram: The report generated by analysis of antimicrobial susceptibility test results (usually from a single health care facility) from a defined period of time that reflects the percentage of first isolates (per patient) of a given species or organism group that is susceptible to each of the antimicrobial agents routinely tested. It helps guide the selection of appropriate antibiotics for treating infections

SDG indicator 3.d.2: Proportion of bloodstream infection due to methicillin-resistant *Staphylococcus aureus* (MRSA) and *Escherichia coli* resistant to third-generation cephalosporins (e.g., ESBL- *E. coli*) among patients seeking care and whose blood sample is taken and tested. Presumptive methicillin-resistant *S. aureus* (MRSA) isolates as defined by oxacillin minimum inhibitory concentration (MIC) and cefoxitin disc diffusion tests according to current internationally recognized clinical breakpoints (e.g., EUCAST or CLSI). *E. coli* resistant to third-generation cephalosporins: *E. coli* isolates that are resistant as defined by current internationally recognized clinical breakpoints for third-generation cephalosporins (e.g., EUCAST or CLSI), specifically ceftriaxone or cefotaxime or ceftazidime.

Preface

Antimicrobial resistance (AMR) poses a significant threat to global health, and Bangladesh is not an exception. As we present the Annual Report of the National Antimicrobial Resistance (AMR) Surveillance in Bangladesh for 2024, we find ourselves at a critical juncture in public health. The burden of AMR is felt acutely in Bangladesh, where the overuse and misuse of antibiotics have created a formidable landscape for resistant pathogens.

This report is a summary of efforts from various stakeholders, including healthcare professionals, researchers, and governmental and non-governmental organizations. Eleven medical colleges and institutes are included as sentinel sites for the AMR case-based surveillance and twenty-one laboratories are included in laboratory-based AMR surveillance. All the sentinel sites send laboratory and epidemiological data weekly and the central team at IEDCR regularly analyzes and updates the data. The analyzed data is uploaded yearly to the WHO Global Antimicrobial Resistance Surveillance System (GLASS) platform through the Communicable Disease Control Program of the Directorate General of Health Services (CDC, DGHS).

This report reflects our ongoing commitment to monitor, analyze, and disseminate the trend of antimicrobial resistance in Bangladesh. It compiles data from diverse healthcare facilities, laboratories, and research institutions for showcasing our collaborative efforts and understanding the complexities of AMR.

Alarming trends have been observed throughout the surveillance period. The rise in resistance rates for key pathogens underscores the urgency of implementing effective antimicrobial stewardship programs and enhancing infection prevention and control measures.

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 in the coming years.

We express our sincere gratitude to the surveillance physicians, nurses, laboratory personnel, project facilitators and others who supported our activities so much at the sites with utmost sincerity. We like to acknowledge the patients. We are thankful to the private laboratory personnel who have supported us with their valuable data. IEDCR is also thankful to the World Health Organization (WHO) for its continuous financial and technical support. IEDCR also acknowledges the Fleming Fund Country and Regional Grant and the Centers for Disease Control and Prevention (CDC), Atlanta, USA for their support.

Your dedication and collaboration are essential in our fight against antimicrobial resistance.
Together, we can safeguard the effectiveness of our current antimicrobial agents and a better future environment for the citizens of Bangladesh.

Prof. Dr. Tahmina Shirin, PhD
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Chair, AMR Surveillance Coordination Subcommittee
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Editorial

The battle against antimicrobial resistance (AMR) is one of the most pressing challenges facing public health today. Surveillance plays a critical role in the fight against AMR. As the sectoral coordination center and National Reference laboratory (NRL) for AMR we are continuing our effort to bring out the real picture of AMR scenario in our country through our surveillance.

Like last year we are also going to publish the AMR Surveillance Report, 2024 this year. Our first report published last year was the first of its kind and we tried to bring out our whole journey from 2016 to 2023 through the report and the national and international activities to face the challenges of AMR. The report is available at our website- **National AMR Surveillance in Bangladesh: 2016-2023**

This year we are more focused on presenting the data. Site specific antibiogram and analyzed data are also included in this report. For the clarity of our readers, I would like to mention that we receive laboratory data through our case based and laboratory-based surveillance sites where public as well as the private sectors are contributing. The case-based surveillance which is regarded as the most informative and effective as well as challenging form of surveillance. Provides data of the patients from eleven sentinel sites, which are mostly public. Side by side our surveillance is enriched with the huge and multifarious volume of data in laboratory-based surveillance from our public laboratories. This is a unique example of public- private partnership.

Preparing the annual report on AMR Surveillance is a monumental task that requires a collective effort. We owe a debt of gratitude to the surveillance site personnel, the team at the sectoral coordination center, the NRL at IEDCR, and our external contributors for their invaluable support.

The report will also be available online at IEDCR website. We welcome any kind of feedback including constructive criticism, suggestions and advice.

We are very happy to inform you that other than the report we have also prepared a mini handbook of antibiogram prepared from the data of our surveillance for the clinicians to support their empirical treatment.

I would like to thank everyone who was involved in the activities. The inspiration and support from the Director of IEDCR was always encouraging. I would also like to thank our development partner World Health Organizations (WHO) for keeping confidence in us and giving us all kinds of support, we need.

We like to move forward with your support.

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Executive Summary

The national AMR surveillance in Bangladesh has been conducted since 2016. It is an active, case-based surveillance system where we collect epidemiological, clinical, and laboratory data from eleven sentinel sites, primarily medical college hospitals. Following the WHO guidelines for priority pathogens, the surveillance collects laboratory samples from urine, blood, stool, sputum, endotracheal aspirate, wound swabs, and pus. Since 2022, an additional arm of the surveillance has been introduced, focusing on passive, lab-based microbiological data. Twenty-two public and private laboratories are now providing their laboratory data to the surveillance data server. The data is analyzed in various ways, and the antibiogram presented in this report combines data from both case-based and laboratory-based surveillance. There is a significant difference in the susceptibility patterns of organisms isolated from indoor, outdoor, and ICU settings.

Highlights of the data

This report presents data from July 2023 to June 2024 including data from 84,098 patients, 71,269 isolates. Among the isolates 3377 are from case-based surveillance and 67,892 from lab-based surveillance. So, case-based surveillance includes 4.97% of total isolates.

The total number of samples tested in case-based surveillance is 16,206 and the number of isolates is 3377 indicating 21% growth of organisms. Highest growth (62%) yielded from endotracheal aspirate and lowest growth (4%) from stool sample. Here *E. coli* is excluded from stool sample as it may represent normal flora of the gut and test for detection of pathogenic strains could not be done. Interestingly, wound swab sample isolate was highest among others while it constitutes only 13% of the total samples.

In case-based surveillance 29% of samples were collected from OPD and 49% samples were collected from ward and 22% from ICU patients. The highest samples were urine (35%), followed by blood (33%), wound swab (13%), stool (13%) and endotracheal aspirate (6%).

In lab-based surveillance highest isolates were from urine sample (62%), followed by blood (11%), sputum (9%), pus (6%), wound swab (4%), tracheal aspirate (2%) and stool sample (2%). In both case and lab-based surveillance the most frequent culture positive organism is *E. coli* constituting 23% and 38% of all isolated organisms respectively.

In case-based surveillance from urine, blood, wound swab, endotracheal aspirate and stool sample the highest isolated pathogen were *E. coli, P. aeruginosa, K. pneumoniae, Acinetobacter spp., S. aureus, Proteus spp., Salmonella spp., Enterobacter spp.,* and *V. cholerae* respectively.

The total number of culture positive isolates from lab-based surveillance is 67,892. The highest isolated organism from all the samples was *E. coli* constituting 38% of all organisms. It is followed by *K. pneumoniae, S. aureus, P. aeruginosa* and *Salmonella* Typhi respectively.

Overall (including both case based and lab-based surveillance) most frequent organism from blood were *S. Typhi* (56%), from stool *E. coli* (68%), from endotracheal aspirate *Acinetobacter spp*. (36%), and from wound swab *P. aeruginosa* (27%).

In case-based surveillance the overall susceptibility pattern of different antibiotics in OPD, ward and ICU have showed significant differences. In ICU patients' lowest susceptibility was observed whereas in OPD patients the susceptibility was quite high relative to ICU.

We have found a high percentage of Multidrug- Resistance in five commonly isolated pathogen *P. aeruginosa, S. aureus, E. coli, K. pneumoniae* and *Acinetobacter spp*. (69%-90%) From the analysis of historical data of our laboratory-based surveillance we have found that the critical priority pathogen as per WHO resistant to the antibiotic Ceftriaxone is rising since 2017 to 2024. In case of enterobacterales (*E. coli, K. pneumoniae, Proteus spp*., and *Enterobacter spp*.) the resistance is increased from 59% to 79%. However, the previously designated critical priority pathogen *P. aeruginosa* (now regarded as high priority pathogen) has been found more resistant during the period from (34% to 53%). Critical priority pathogen meropenem resistant enterobacterals also increased from 13% in 2017 to 41% in 2024. In case of Acinetobacter spp. it is high and around 80% during the period. *Acinetobacter* is found to be the highest MDR pathogen (90%) followed by *K. pneumoniae* (85%).

ESBL producing Multidrug resistant *E. coli* in blood which is one of the indicators of AMR in SDG is found 34% (confirmed by combined disc diffusion test) and another indicator MRSA (Methicillin Resistant S. aureus) is found 41% (overall data) We analyzed the susceptibility data of different pathogen according to location: ICU, Indoor and outdoor setting.

In case of *E. coli* Fosfomycin and Nitrofurantoin, which are mainly used in urine sample showed high value in all locations. In contrast, Ampicillin have showed very low values suggesting its limited effectiveness, especially in the ICU. Imipenem and Meropenem demonstrate high effectiveness across all locations. Gentamicin have showed gradual improvement across ICU (46), Indoor (60), and Outdoor (65).

In case of *K. pneumoniae* Imipenem, Meropenem, and Gentamicin have demonstrated high susceptibility across all three settings. Tetracycline maintains moderate-to-high susceptibility, particularly in the ICU and Indoor settings. Fosfomycin have showed exceptional susceptibility outdoors. Cefuroxime consistently displays very low susceptibility values, underscoring its limited utility against hospital-acquired infections.

In the case of *Proteus* spp., only indoor data is available. Amikacin and gentamicin show high susceptibility, whereas ampicillin and cefuroxime show low susceptibility. In the case of *P. aeruginosa*, netilmicin, imipenem, and meropenem exhibit high susceptibility; ciprofloxacin shows moderate susceptibility, while ceftazidime shows low susceptibility across all locations.

In case of *Salmonella Typhi* ceftriaxone, imipenem and meropenem showed high level of susceptibility whereas that of ciprofloxacin was very poor. In case of *S. aureu*s Doxycycline and linezolid susceptibility is found higher in all locations. Trimethoprim-Sulfamethoxazole showed

higher susceptibility. However, Oxacillin susceptibility was relatively poor.

In case of *V. cholerae* only indoor data is available which shows tetracycline susceptibility is higher than other antibiotics. Overall, the data indicate significant resistance to commonly used antibiotics (e.g., Ampicillin, Cefuroxime).

In laboratory-based surveillance urine sample was significantly high (62%) followed by blood (11%). *E. coli* is the highest isolated pathogen from all the sample. Among the bacterial priority pathogen list Carbapenem resistant Acinetobacter is found at an alarming amount (63%). Different *candida* species are found in different specimen and highest among them is *C. albicans* (45%) followed by *C. tropicalis* (32%). Voriconazole (97%) and Micafungin (93%) was found most susceptible in *C. albicans* and *C. tropicalis* respectively.

In overall analysis from case based and lab-based surveillance we have found *E. coli, Salmonella Typhi, E. coli, Acinetobacter, K. pneumoniae* and *P. aeruginosa* constituting the highest number of pathogens from urine, blood, stool, Endotracheal aspirate, and wound swab respectively. Highest (68%) MDR pathogen was found from *Acinetobacter*. The suspected ESBL *E. coli* (as per SDG criteria) from blood is found 89% and MRSA in blood 59% which is higher in ICU than other indoor patients.

However, in overall data analysis which has the major contribution of lab-based surveillance data where the isolates are mostly coming from urine samples of outdoor patients have shown higher susceptibility pattern of pathogens and lower percentage of critical priority pathogens.

Other than bacteria we have found different *candida* species from different specimen- mostly in urine followed by blood. *C. albicans* was the highest (44%) among other species followed by *C. tropicalis* (32%)

In this report we have also analyzed data individually from eleven sentinel sites and extensively analyzed the samples, organisms and their resistant pattern, antibiogram and the prevalence of multi-drug resistant pathogens.

We have analyzed prevalence of WHO critical priority pathogen in different sites and found High prevalence of Carbapenem-resistant *Acinetobacter* in RMCH (98%) and MMCH (95%), the prevalence of Carbapenem-resistant *E. coli* ranges from 5% (BITID) to 47% (DMCH), with significant variability among medical colleges. MMCH and RMCH also show high resistance rates, 43% and 36%, respectively. Most institutions reported Ceftriaxone-resistant *E. coli* over 60%, with DMCH (92%) and CMCH (84%) being particularly high. BITID and SBMCH have relatively lower resistance, at 64% and 62%. Highest Cefotaxime-resistant *E. coli* is found in RMCH (78%) and KMCH (84%) with uniform resistance trends seen across other colleges.

Antibiotic usage in case-based surveillance site patients

In case-based surveillance the antibiotic use data is taken from every patient. So, we have a database of (12,326) antibiotics used over the period of. July 2023-June 2024. Among this 53% was used in ward, 41% in ICU and 5% in OPD patients. The highest used antibiotic was Ceftriaxone (28%) followed by Meropenem (14%) and in ward Ceftriaxone was the most used antibiotic (39.6%) and in ICU Meropenem (33.9%) Ceftriaxone (22.2%). In OPD Cefixime (12.7%) was mostly used antibiotic and followed by Ceftriaxone (12.6%).

In this surveillance we include patients with wound infection, Urinary Tract Infection (UTI), blood stream infection, lower respiratory tract infection and diarrhea. We have found that other than diarrhea and LRTI (endotracheal aspirate sample in ICU patients) Ceftriaxone was the most preferred antibiotic of choice. In case of diarrhea, it is Azithromycin and in LRTI it is Meropenem.

In site wise distribution we have found that Ceftriaxone is the most preferred antibiotic in nine out of eleven sites ranging from 24% in UAMC to 43.8% in SOMCH. In DMCH it is Meropenem. Interestingly Meropenem is the 2nd topmost used drug in six medical colleges and 3rd topmost used drug in two medical colleges.

Among the total used antibiotic 77% was from Watch category, 20% was from Access Category and 3% was from reserve category. Linezolid is the only Reserve group of drugs within top ten used antibiotic which is the highest used reserved group of antibiotics. It is followed by Tigecycline and Ceftazidime+ Avibactam. Reserve group of drugs was mostly used (67.5%) in ICU followed by Surgery unit (18.1%).

Introduction

In just over 100 years, antibiotics have significantly influenced modern medicine and increased the average human lifespan by 23 years (1). However, the increasing antimicrobial resistance (AMR) presents a serious challenge. Antimicrobial resistance undermines the effective treatment of bacterial, viral, fungal and parasitic infections. It represents an escalating crisis that poses an imminent and severe threat to countries of all economic levels. However, it is closely linked to poverty, lack of sanitation, poor hygiene and pollution. Therefore, low-income and lower-middle-income countries are the worst affected by AMR. (2). The current pace of progress is insufficient, and robust action is required so as not to undermine decades of advances in health.

AMR was, directly and indirectly, responsible for an estimated five million or so deaths in 2019. (3). In 2014, the Review on Antimicrobial Resistance (AMR) projected that 10 million deaths caused by AMR could occur by 2050 (3). In the years since, WHO committed to the 2015 AMR Global Action Plan (GAP), AMR was the focus of a high-level UN general assembly in 2016, and an AMR-specific indicator was included as a Sustainable Development Goal: to reduce the percentage of bloodstream infection due to selected antimicrobial-resistant organisms (indicator 3.d.2). (3)

Increased and inappropriate use of antibiotics are the major causes leading to the development of AMR. However, the pathogens become naturally resistant to antimicrobials over time due to genetic changes. AMR can develop and spread through all kinds of antimicrobials such as appropriate, inappropriate, over and under use. Once developed, resistance can spread not only from one microorganism to another microorganism, but also from humans to humans, between humans and animals, and human and plants.

Antimicrobial Resistance (AMR) is a global health challenge, and its transmission and spread are influenced by various environmental complexities.

Environmental Complexities in transmission and spread of AMR

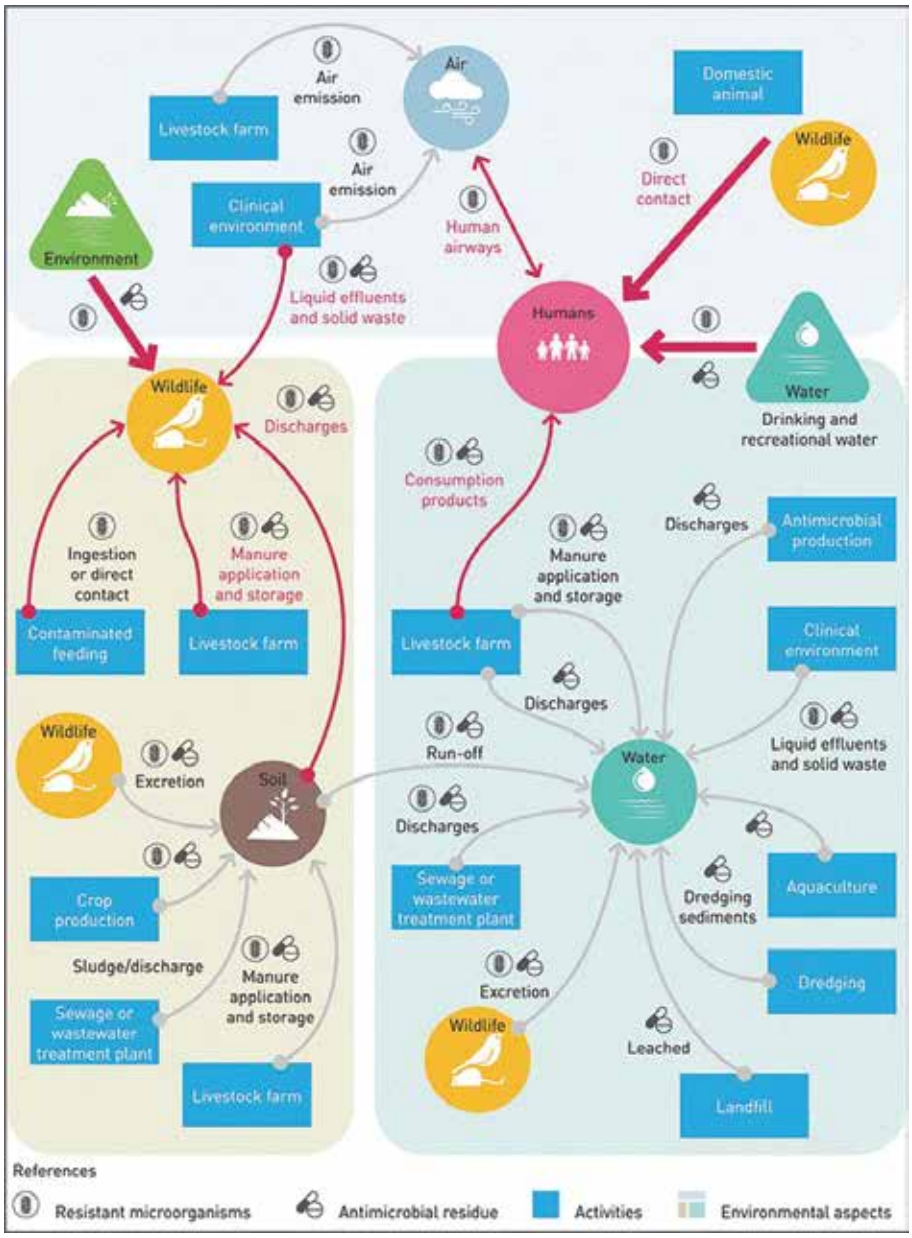


Figure 1: Environmental complexities in Transmission and spread of AMR

Source: Bracing for Superbugs: Strengthening Environmental Action in the One Health Response to Antimicrobial Resistance. United Nations Environment Programme, 2023, https://www.unep.org/resources/report/bracing-superbugs.

Addressing AMR requires a One Health approach, integrating human, animal, and environmental health strategies. This includes better regulations, improved waste management, and public awareness campaigns.

Current Global scenario on AMR:

Infections from resistant bacteria are a health concern comparable to, if not potentially greater than, HIV and malaria and affect all regions of the world. A 2021 systematic analysis on the global burden of antimicrobial resistance (AMR) from 1990 to 2021, published in 2024 revealed that 4.71 million deaths were associated with bacterial AMR, with 1.14 million deaths directly attributed to it. While deaths from AMR in children under five decreased by approximately 50%, there has been a significant increase in deaths among adults and older individuals (3). The report projects that by 2050, an estimated 8.22 million deaths globally will be associated with AMR, with 1.91 million directly attributable to it. Notably, individuals over 70 years of age are expected to face the highest number of attributable deaths.

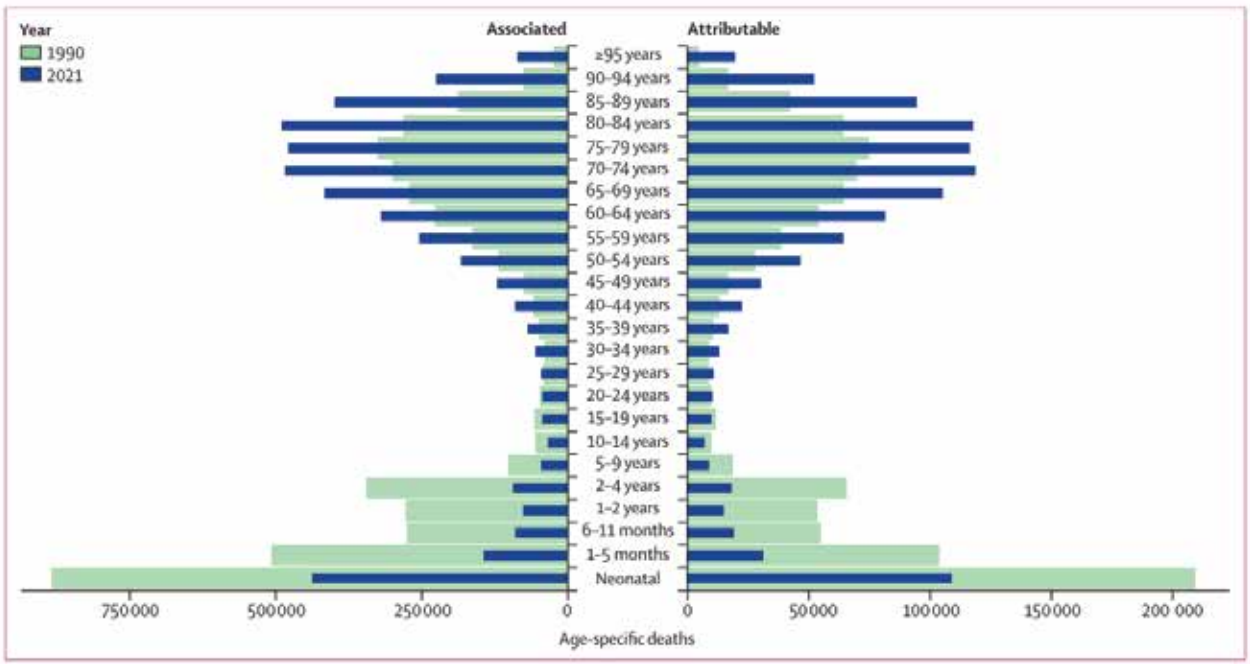


Figure 2: Deaths attributable and associated with antimicrobial resistance, by detailed age group, for 1990 and 2021 Counterfactuals have distinct x-axes

Source: Antimicrobial Resistance Collaborators. "Global Burden of Bacterial Antimicrobial Resistance 1990–2021: A Systematic Analysis with Forecasts to 2050." The Lancet, vol. 403, no. 10424, 2024, pp. 186–210. https://doi.org/10.1016/S0140-6736(23)02732-2.

In 2019 among the 21 GBD regions, Western sub-Saharan Africa had the highest burden, with 27·3 deaths per 100 000 (20·9–35·3) attributable to AMR. Five regions had all-age death rates associated with bacterial AMR higher than 75 per 100 000: all four regions of sub-Saharan Africa and south Asia.

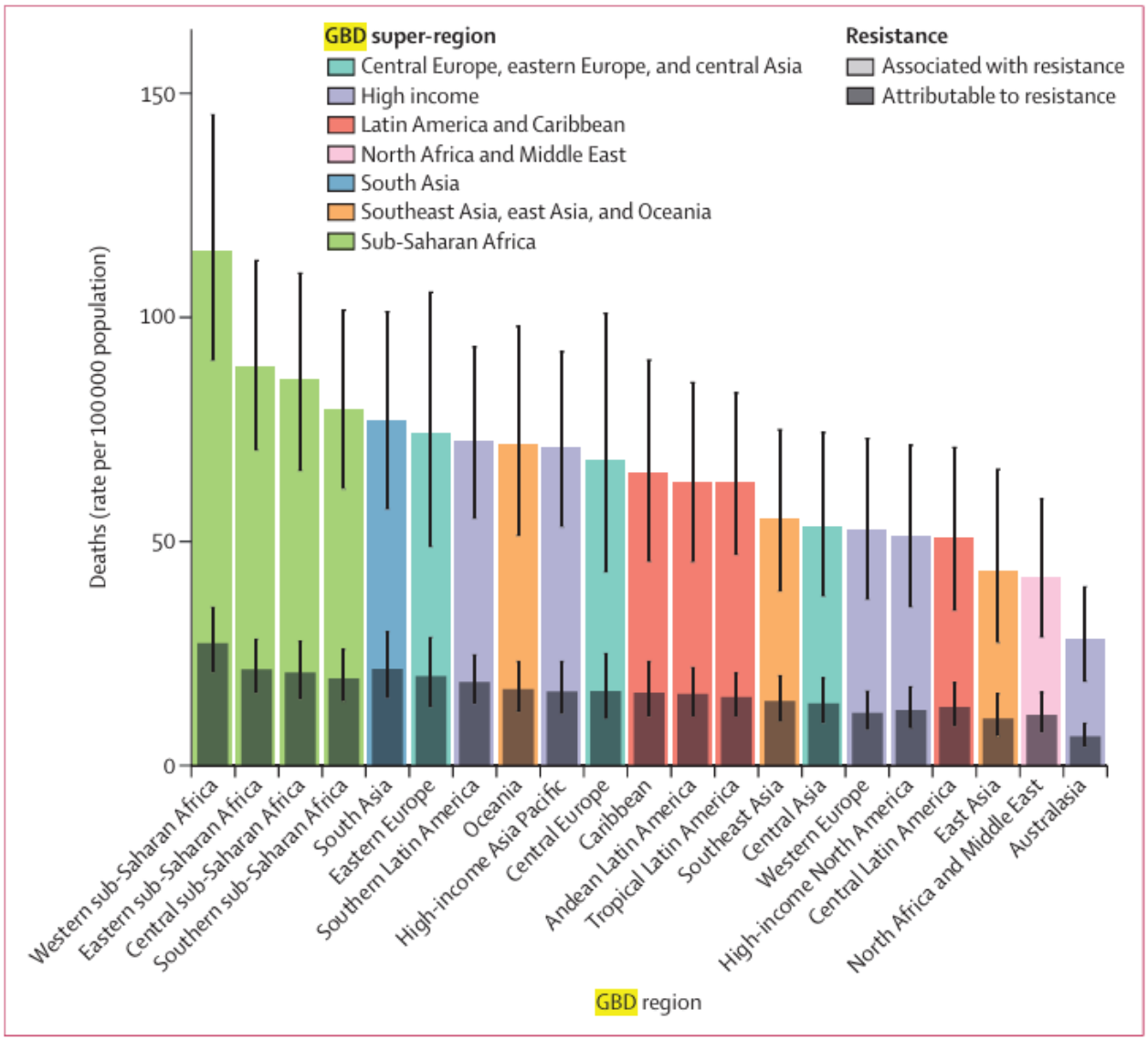


Figure 3: All-age rate of deaths attributable to and associated with bacterial antimicrobial resistance by GBD region, 2019

Source: Antimicrobial Resistance Collaborators. "Global Burden of Bacterial Antimicrobial Resistance in 2019: A Systematic Analysis." The Lancet, vol. 399, no. 10325, 2022, pp. 629–655. https://doi.org/10.1016/S0140-6736(21)02724-0.

In 2019, six pathogens were each responsible for more than 250000 deaths associated with AMR: *E. coli, S. aureus, K. pneumoniae, S. pneumoniae, A. baumannii*, and *P. aeruginosa*, by order of number of deaths. Together, these six pathogens were responsible for 929000 of 1·27 million deaths (0·911–1·71) attributable to AMR and 3·57 million (2·62–4·78) of 4·95 million deaths (3·62–6·57) associated with AMR globally in 2019.

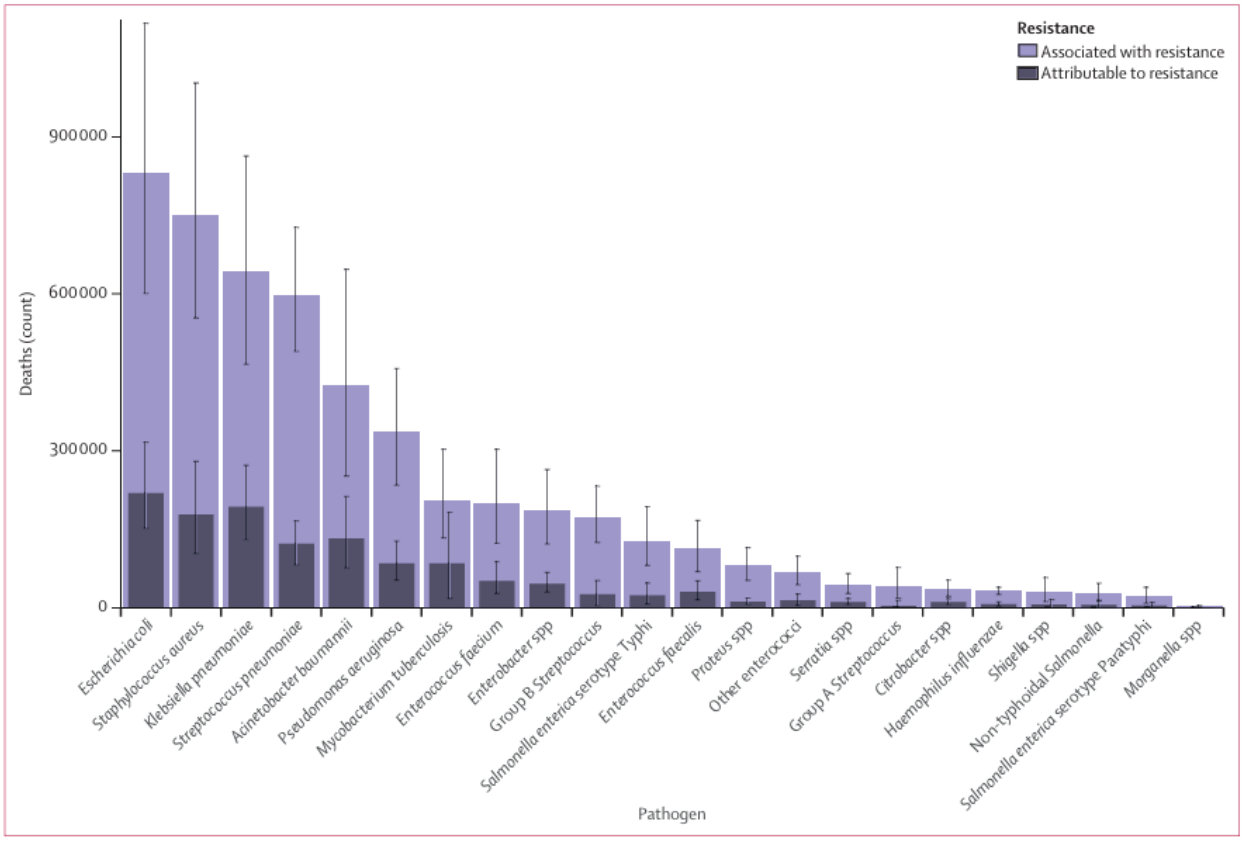


Figure 4: Global deaths (counts) attributable to and associated with bacterial antimicrobial resistance by pathogen, 2019

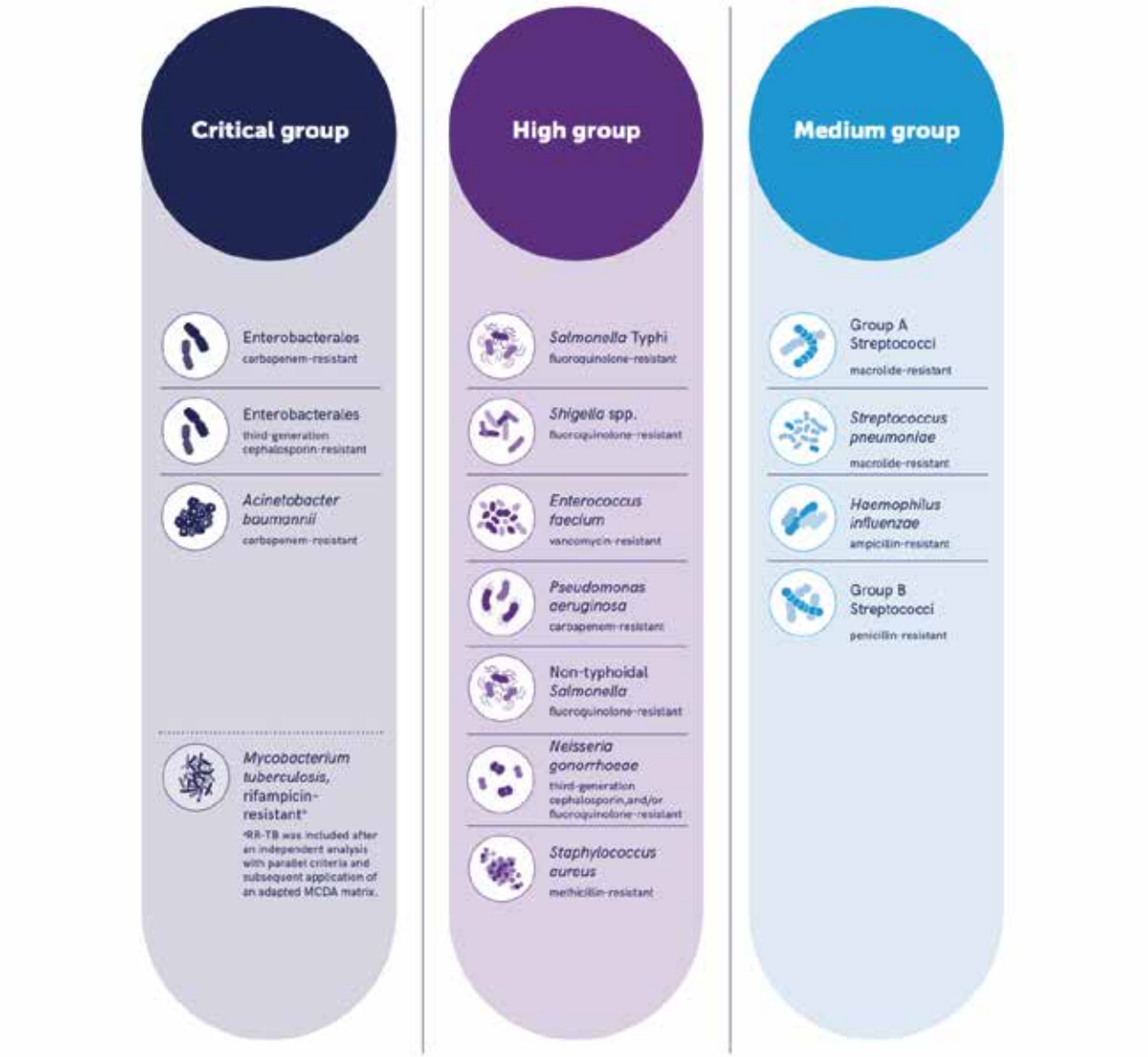
Source: Antimicrobial Resistance Collaborators. "Global Burden of Bacterial Antimicrobial Resistance 1990–2021: A Systematic Analysis with Forecasts to 2050." The Lancet, vol. 403, no. 10424, 2024, pp. 186–210. https://doi.org/10.1016/S0140-6736(23)02732-2.

Global initiatives to contain AMR

Addressing antimicrobial resistance (AMR) in the human health sector requires global efforts focused on several areas: effective infection prevention and control (IPC) measures, equitable access to diagnostics and treatment, continuous surveillance to monitor trends in AMR, and investments in research and development (R&D) for creating new medicines, diagnostics, and prevention tools. Since its release in 2017, the WHO Bacterial Priority Pathogens List (BPPL) has guided R&D investment and served as the basis for activities related to surveillance and control of antibacterial resistance.

In 2024 WHO updated Bacterial Priority Pathogens List (WHO BPPL) encompasses 24 pathogens, across 15 families of antibiotic-resistant bacterial pathogens. Prominent among these are Gram-negative bacteria resistant to last-resort antibiotics, drug-resistant *Mycobacterium tuberculosis*, and other high-burden resistant pathogens such as *Salmonella, Shigella, Neisseria gonorrhoeae, Pseudomonas aeruginosa*, and *Staphylococcus aureus* (4).

WHO Bacterial Priority Pathogens List, 2024



Since the acknowledgement of AMR as a global public health threat in 1998, WHO has developed initiatives to support the global surveillance and research on AMR through the Global Antimicrobial Resistance and Use Surveillance System (GLASS) in 2015.

By October 2023, a total of 132 countries were enrolled in GLASS. A total of 120 countries were enrolled in AMR only; 12 countries were enrolled in AMC (Antimicrobial Consumption) only and 71 countries were enrolled in both AMR and AMC (5).

The status and 8-year trend of national AMR surveillance systems in human health, in Asia Pacific region based on TrACSS 2024 data (N = 34–38 countries) shows a steady increase in standardized surveillance systems over time.

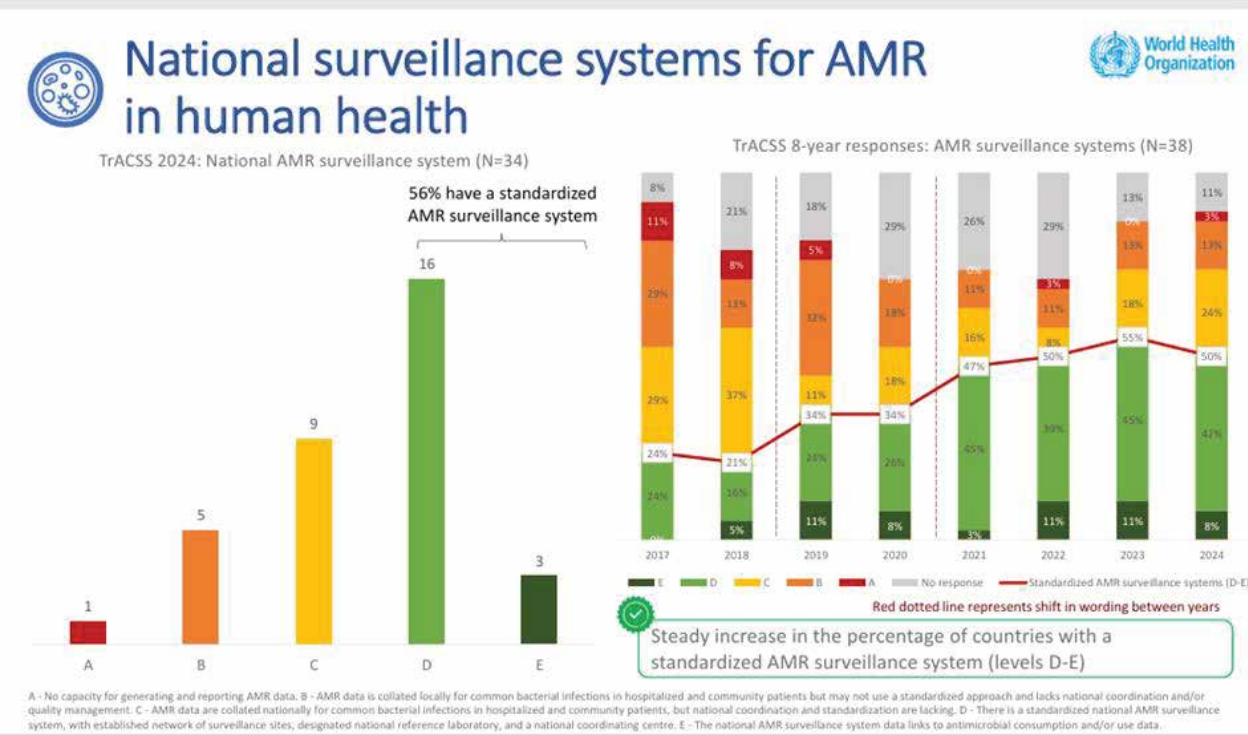


Figure 5: National Surveillance systems for AMR in human health

The UK Government established the UK aid programme Fleming Fund in 2015 in response to the UK AMR Review and the WHO Global Action Plan, which is a £265 million programme to support countries across Africa and Asia, including Bangladesh (6). In 2019, with the help of The Fleming Fund, the CAPTURA project (Capturing Data on AMR Patterns and Trends in Use in Regions of Asia) was awarded with the specific objective of expanding the volume of historical data on antimicrobial resistance (AMR), consumption (AMC), and use (AMU) in the human health care sector across 12 countries in South and Southeast Asia, including Bangladesh.

The first United Nations General Assembly (UNGA) High-Level Meeting on AMR occurred in 2016. This meeting led to the adoption of a political resolution by member states, calling for the development of NAP to address AMR issues. The Antimicrobial Resistance (AMR) National Action Plans (NAPs) as of 2024 in Asia-Pacific regions, highlighting both current progress and an 8-year trend in Asia pacific regions shows Most countries have AMR plans, but few have sufficient funding and monitoring. There's a stagnation in the last two years in financial and monitoring aspects (stuck at 29–32%).

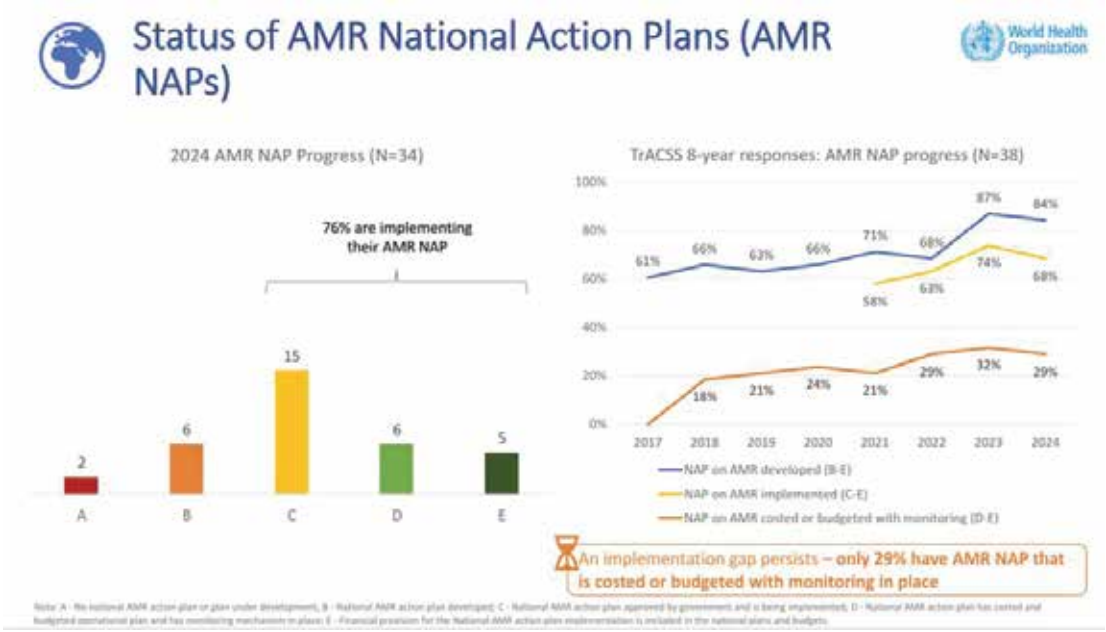


Figure 6: Status of AMR National Action Plans (AMR NAPs)

In 2022, the Tripartite—comprising the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (WOAH), and the WHO—collaborated with the United Nations Environment Programme (UNEP) to form the Quadripartite, emphasizing a One Health approach to combating AMR.

On October 9, 2024, global biotechnology and pharmaceutical companies convened with leading experts and researchers at the Global AMR Summit in Cambridge, Massachusetts. The focus of the summit was to discuss the causes of antibiotic resistance, explore responses to this challenge, and assess the value of novel antibiotics in addressing the public health threat posed by AMR.

Additionally, the WHO Regional Office for the Eastern Mediterranean organized a regional meeting titled "Data for Action: Using Antibiotic Consumption Data to Improve Prescription and Stewardship Activities" in Doha, Qatar, from May 13 to 15, 2024.

On September 26, 2024, during the 79th United Nations General Assembly (UNGA), world leaders adopted a Political Declaration on Antimicrobial Resistance (AMR), outlining commitments to combat this escalating global health threat. Among the targets set up in this meeting for the year 2030 of the countries were- to reduce AMR related deaths reduced by 10%, adopt comprehensive and actionable multisectoral national action plans on AMR by, Mobilize US$ 100 million target for achieving at least 60% of countries having funded plans, 80% countries having access to bacterial and fungal resistance testing, 95% country participation in the annual Tracking Antimicrobial Resistance Country Self-Assessment Survey (TrACSS), All countries' health facilities have WASH services and 90% meet WHO's minimum requirements for infection prevention and control, Use of WHO Access group antibiotics expanded to reach over 70% of global human antibiotic use globally and Reduction of the quantity of global antimicrobials use in the agri-food system.

This declaration represents a significant step in the global fight against AMR, setting clear targets and emphasizing the need for coordinated, multisectoral action to safeguard public health.

The Fourth Global High-Level Ministerial Conference on Antimicrobial Resistance (AMR) convened in Jeddah, Saudi Arabia, on November 15-16, 2024, under the theme *"From Declaration to Implementation – Accelerating Actions Through Multisectoral Partnerships for the Containment of AMR* served as a pivotal platform for exchanging best practices and advancing the implementation of strategies to contain AMR through multisectoral partnerships, reinforcing the global commitment to combating this pressing health threat.

New Antibiotic Pipeline

The latest WHO report in June 2024 highlights a concerning situation regarding the development of antibacterial agents. While the clinical pipeline has grown from 80 agents in 2021 to 97 in 2023, there remains a pressing need for innovative solutions to combat serious infections and address antimicrobial resistance (AMR). Of the 32 traditional antibiotics under development for priority pathogens, only 12 are considered innovative, and just 4 target WHO's 'critical' pathogens. Overall, antibacterial agents in the clinical pipeline combined with those approved in the last six years are still insufficient to tackle the ever-growing threat of the emergence and spread of drug-resistant infections.

Bangladesh Perspective of AMR

Activities to fight against AMR by different programs and departments

The Institute of Epidemiology, Disease Control & Research (IEDCR), has been conducting the National Antimicrobial Resistance (AMR) Surveillance for human health since 2017. In 2016, the AMR surveillance project in Bangladesh was initiated by IEDCR with support from the Global Health Security Agenda (GHSA) and a cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC). IEDCR is the Sectoral Coordination Center (Human health) for AMR Surveillance and the National Reference Laboratory (NRL) for AMR is situated here.

Currently, two types of surveillance are in operation: case-based surveillance and laboratory-based surveillance, which provide data on trends and patterns of resistant microorganisms. Each year, IEDCR shares the AMR surveillance data with relevant stakeholders at home and abroad through central dissemination program. The live AMR dashboard at IEDCR (which is indeed a one health dashboard including data from animal health side by side) is also accessible to all (https://dashboard.iedcr.gov.bd/amr/) All the AMR surveillance sentinel sites prepare their own antibiogram and disseminate their data locally regularly with active support from sectoral coordination center at IEDCR. Yearly the national surveillance data is uploaded in GLASS platform through the Communicable Disease Control Program of DGHS (CDC, DGHS).

Recently, the AMR surveillance strategy for 2020-2025 has been developed by CDC, DGHS IEDCR published the "National Antimicrobial Resistance Surveillance Report, Bangladesh, 2016-2023" in November 2023, marking the first comprehensive report of its kind in the country.

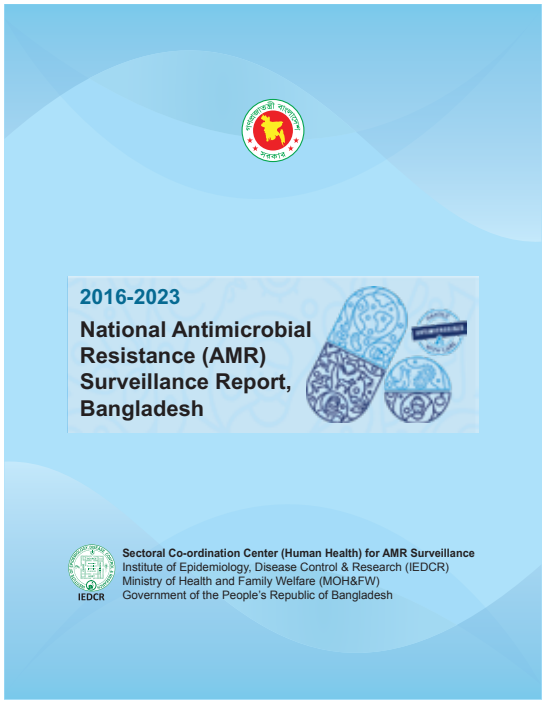


Figure 7: National AMR Surveillance Report of Bangladesh (2016-2023)

National Action Plan (NAP) on AMR in Bangladesh

In alignment with the World Health Organization's Global Action Plan on AMR, Bangladesh introduced its inaugural NAP for AMR containment covering the period from 2017 to 2022. This multisectoral policy document emphasized a 'One Health' approach, integrating efforts across human health, animal health, and environmental sectors. The plan outlined strategic objectives aimed at enhancing awareness, strengthening surveillance, reducing infection rates, optimizing antimicrobial use, and promoting sustainable investment in countering AMR.

Implementation and Challenges

The implementation of the 2017-2022 NAP faced several challenges. While the plan was comprehensive, gaps in financing and resource allocation hindered its full execution. Additionally, the need for more robust multisectoral collaboration and stakeholder engagement was identified as a critical area for improvement.

Updated National Action Plan (2023-2028)

Building upon the experiences and lessons learned from the initial NAP, Bangladesh launched an updated National Strategy and Action Plan for 2023 to 2028. National Strategy and Action Plan for Antimicrobial Resistance Containment in Bangladesh, 2023-2028 was published by DGHS and MoHFW in 2023.

This revised plan continues to embrace the One Health approach and seeks to address previous shortcomings by emphasizing stronger governance structures, enhanced surveillance systems, and more effective antimicrobial stewardship programs. The updated NAP serves as a roadmap for coordinated actions to tackle AMR, involving various sectors including human health, animal health, aquatic health, and the environment.

The strategy takes the following principles into account:

- Reducing the disease burden and the spread of infection
- Improving access to appropriate antimicrobials
- Ensuring rational use of antimicrobials
- Strengthening health systems and their surveillance capabilities
- Enforcing regulations and legislation
- Encouraging the development of appropriate new drugs, diagnostic tools and vaccines. All activities are in one health approach

Costed National Action Plan

To ensure the effective implementation of the NAP, Bangladesh has developed a National Costed Action Plan. This plan provides a detailed financial framework, outlining the estimated costs associated with each strategic objective and intervention. By identifying funding requirements and potential sources, the costed action plan aims to facilitate sustainable financing mechanisms and ensure that resources are allocated efficiently to priority areas in the fight against AMR.

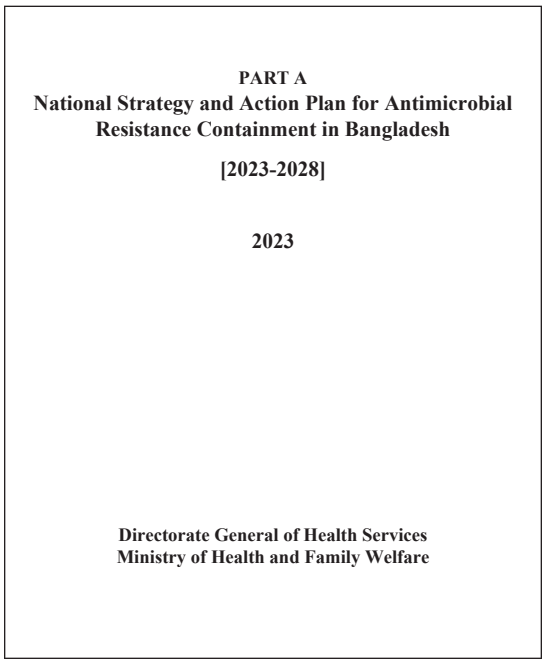


Figure 8: National strategy and action plan for AMR containment in Bangladesh (2023-2028)

AMR Containment activities done by Communicable Disease Control (CDC) in 2023-2024

The CDC program under the Disease Control Division, Directorate General of Health Services (DGHS) in Bangladesh has been leading Antimicrobial Resistance (AMR) containment activities by establishing governance and coordination through a One Health approach. Guided by the National Strategy and Action Plan for Antimicrobial Resistance Containment in Bangladesh 2023-2028, AMR advocacy and stewardship in healthcare facilities have been prioritized. Throughout 2023-2024, the CDC implemented several activities to promote prudent antimicrobial use and enhance AMR containment activities. In 2023, the CDC held two AMR Core Working Group (CWG) meetings and a residential workshop to draft a National Antimicrobial Stewardship (AMS) Guideline for healthcare settings. To create awareness at the local level, the CDC also organized multiple AMS sensitization workshops for Upazila Health and Family Planning Officers (UHFPOs). Notably, in November 2023, a national advocacy meeting was held during World AMR Awareness Week (WAAW), bringing together representatives from the Ministry of Health and Family Welfare, the Ministry of Fisheries and Livestock, DGHS, DGME, DGDA, DLS, DOE, DOF, developments partners, and academia. In 2024, the CDC continued these efforts by organizing two National Steering Committee meetings, two CWG meetings, and a National Technical Committee meeting on AMR. The finalized AMS Guideline was disseminated to Divisional Directors, Civil Surgeons, Hospital Superintendents, and Hospital Directors, further strengthening AMR stewardship practices across public healthcare facilities. This year, to celebrate the WAAW 2024, CDC has distributed AMR posters to all tiers of healthcare facilities (both public and private).

National Technical Committee meeting on AMR containment

Core working group of AMR containment meeting

Activities done in combating AMR by Director General of Drug Administration (DGDA) in 2023-2024

The DGDA is the National Regulatory Authority for medicines in Bangladesh. DGDA regulates both human and veterinary medicines in the country and serves as the national focal point for Antimicrobial Consumption (AMC) and Antimicrobial Use (AMU) surveillance. As a regulatory authority combating antimicrobial resistance (AMR), DGDA focuses on regulation, surveillance, awareness, monitoring, post-marketing surveillance, and pharmacovigilance.

DGDA has established an AMR Cell with specific agenda. Major achievements of the DGDA AMR Cell in recent years include:

(a) The Drug and Cosmetics Act-2023 was approved by Parliament in September 2023, and 4th March 2024 marks the first day of its implementation. This Act prohibits the sale of antibiotics without a prescription. The implementation of this Act on 4th March 2024 marks a milestone in the effort to control antibiotic misuse. In 33 districts, 157 cases were filed against pharmacies that sold antibiotics without prescriptions, resulting in fines totaling 7,75,500 TK from March to July 2024 by mobile courts.

Implementing the Drug and Cosmetics Act-2023 for antibiotics.

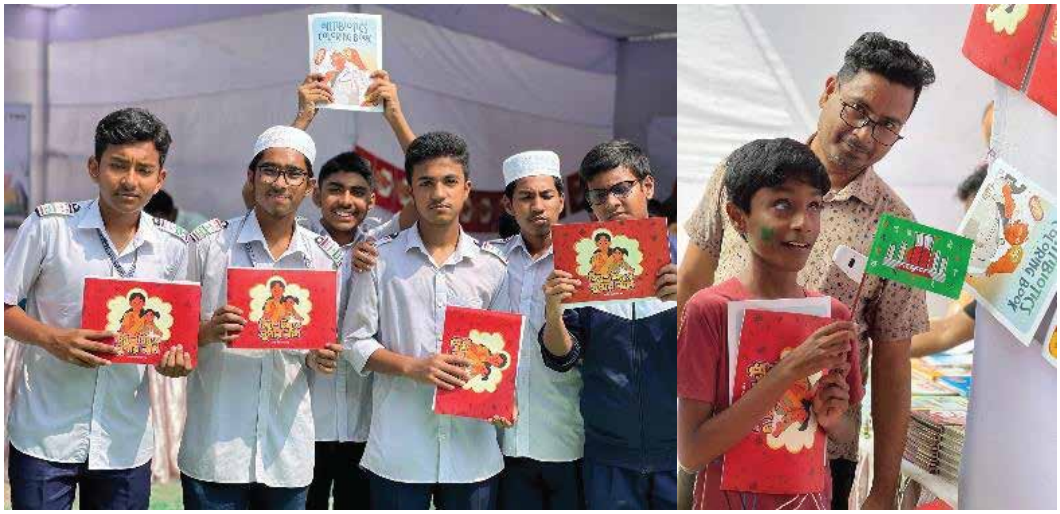
(b) Establishing the Antimicrobial Consumption (AMC) surveillance system and reporting to WHO-GLASS.

DGDA is conducting the Antimicrobial Consumption (AMC) surveillance from 2015 to 2021. DGDA has been enrolled in the WHO-GLASS AMC platform in 2022. From the AMC surveillance report, it is observed that the antimicrobial drug consumption trend is increasing in Bangladesh. Watch category antibiotic consumption is higher than the Access category.

(c) Developing the "National Guideline on AMC Surveillance in Bangladesh."

(d) Working to include a "red label" with the message "Do not use this medicine without the prescription of a registered physician" on antibiotic packaging to create public awareness and easy identification of antibiotics.

(e) Producing various awareness materials, including the comic book "Tinu Minu & Superbug" (which was also adapted into an animation for children), a coloring book titled "Invention of Penicillin," and different awareness posters, including the "WHO-AWaRe" poster.



Distribution of awareness material, the comic book "Tinu Minu & Superbug"

(f) Monitoring awareness and regulatory activities nationwide, such as awareness programs for pharmacy retailers and physicians.

From January to October 2024, 173 awareness programs were conducted in 32 districts. During these campaigns, DGDA officials informed drug sellers about the new Drug and Cosmetics Act-2023. They suggested maintaining a register to keep records of the purchasing and selling of antibiotics, as well as preserving prescriptions.

Awareness program for pharmacy retailers

(g) Initiating the incorporation of AMR issues into the secondary education curriculum.

Link:https://www.who.int/about/accountability/results/who-results-report-2022-2023/country-story/2023/empowering-bangladesh-s-next-generation--confronting-antimicrobial-resistance-through-education-and-awareness

(h) Developing a methodology for AMC surveillance for veterinary medicine.

(i) DGDA has banned 34 antibiotics in veterinary practices that are critically important for human health.

Activities done by The Department of Livestock Services (DLS)

Antimicrobial Resistance Surveillance (2023-2024) Report of DLS

The Department of Livestock Services (DLS) is actively implementing antimicrobial resistance (AMR) surveillance through its Epidemiology unit as part of the National Action Plan to monitor and combat the rising threat of AMR.

During the 2023-2024 surveillance period, the proportion of antimicrobial use (AMU) across different classes documented through poultry farm assessments using the Bangladesh Animal Health Intelligence System (BAHIS) system, with support from FAO. Additionally, a 'farm-level AMU monitoring' initiative is being conducted with assistance from the Fleming Fund.

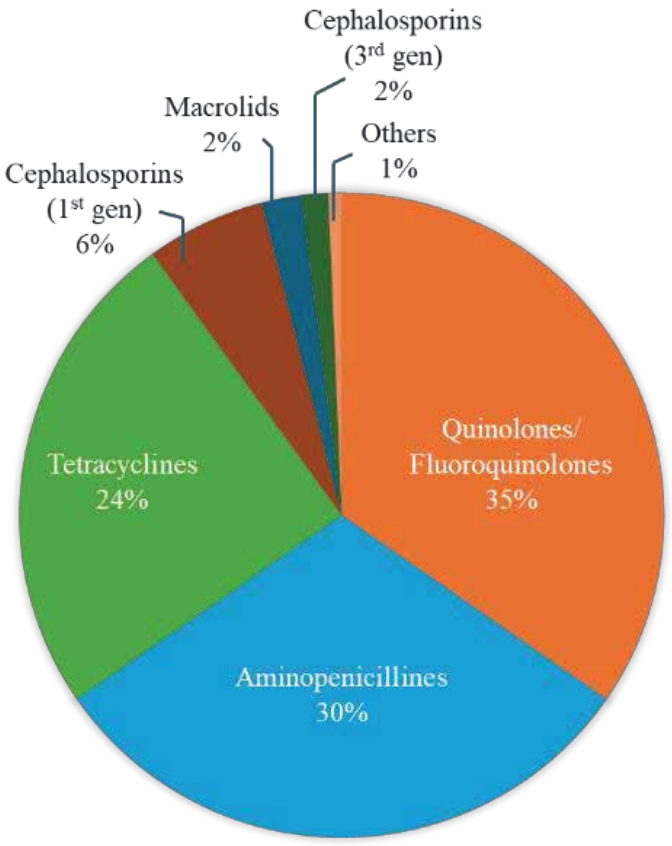
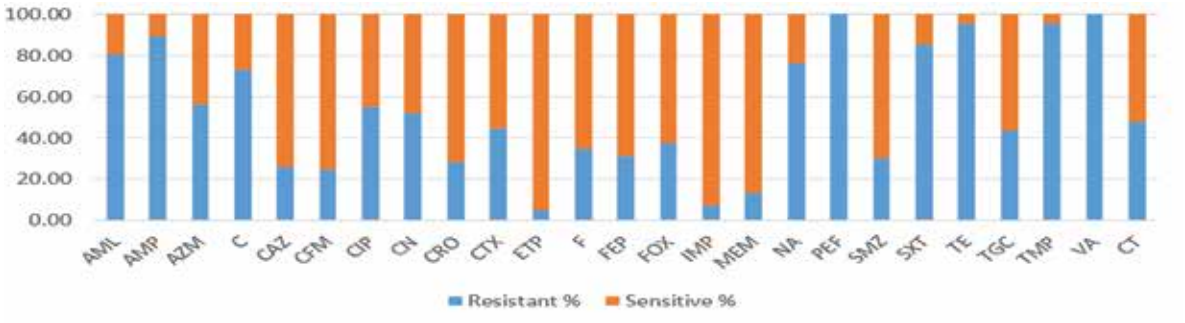


Figure 9: Proportion of antimicrobial classes from poultry farm assessment

The organisms (E. coli, Salmonella, Enterococcus, and Campylobacter) were isolated from fecal samples collected from farms and cecal samples from live bird markets in laboratories, including the Central Disease Investigation Laboratory (CDIL), Bangladesh Livestock Research Institute (BLRI), Poultry Research and Training Centre (PRTC) and Field Disease Investigation Laboratories (FDIL) of Feni and Joypurhat. These isolates were then tested for antimicrobial resistance using the disc diffusion method, assessing their sensitivity to various classes of antimicrobials, with support from the Fleming Fund under the animal health sector AMR surveillance network. The results are presented in Figures 2, 3, 4 and 5. The AMR pattern of E. coli indicated resistance to 12 out of 29 tested antibiotics, with resistance rates ranging from 90% to almost 100%.

Antibiogram of *E. coli*



AML*= *Amoxicillin*, *AMP*=*Ampicillin*, *AZM*= *Azithromycin*, *C*= *Chloramphenicol*, *CAZ*= *Ceftazidime*, *CFM*= *Cefixime*, *CIP*= *Ciprofloxacin*, *CN*= *Gentamicin*, *CRO*= *Ceftriaxone*, *CTX*= *Cefotaxime*, *ETP*= *Ertapenem*, *F*= *Nitrofurantoin*, *FEP*= *Cefepime*, *FOX*= *Cefoxitin*, *IMP*= *Imipenem*, *MEM*= *Meropenem*, *NA*= *Nalidixic acid*, *PEF*= *Pefloxacin*, *SMZ*= *Sulfamethoxazole*, *SXT*= *Sulfamethoxazole & Trimethoprim*, *TE*= *Tetracycline*, *TGC*= *Tigecycline*, *TMP*= Trimethoprim, *VA*= Vancomycin, *CT*= *Colistin

Figure 10: Antibiogram of *E. coli* isolated at the designated laboratories under AMR surveillance

Out of the 21 antibiotics tested for the resistance pattern of Salmonella, the organism showed 100% resistance to amoxicillin, cefuroxime, and vancomycin. The lowest resistance observed was 8% against meropenem, followed by 9% against ceftazidime and 12.5% against cefepime.

Antibiogram of *Salmonella*

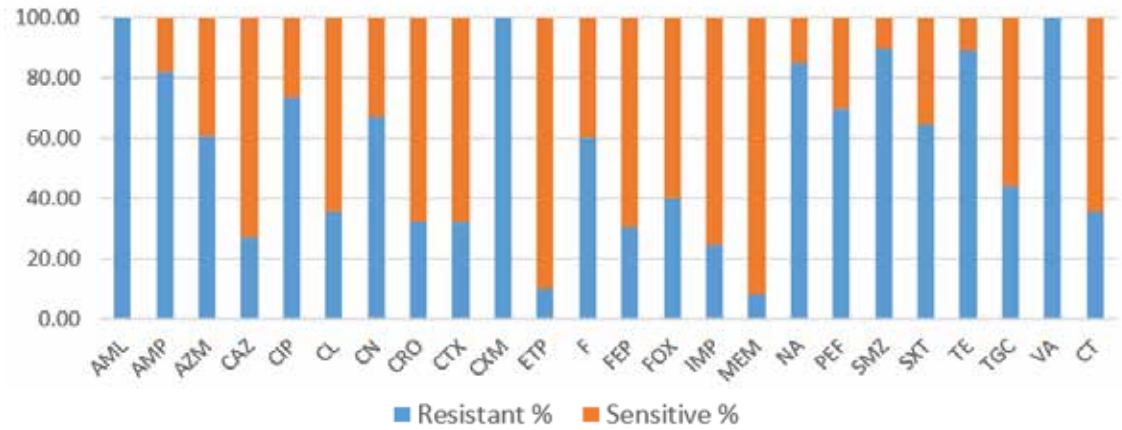


Figure 11: Antibiogram of Salmonella isolated at the designated laboratories under AMR surveillance

For Campylobacter, a total of 7 antibiotics were tested, and 100% resistance was found against nalidixic acid, oxytetracycline, and tetracycline. Resistance to ciprofloxacin was 95.65%, while the lowest resistance (10%) was observed for erythromycin and streptomycin, followed by gentamicin at 26%.

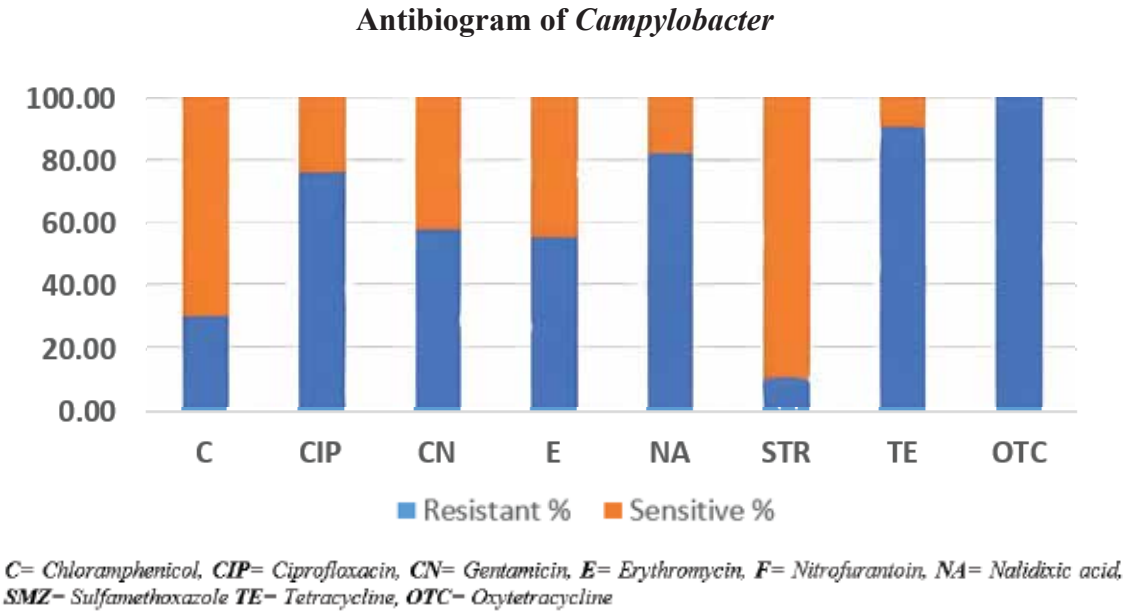


Figure 12: Antibiogram of Campylobacter isolated at the designated laboratories under AMR surveillance

The sink surveillance for AMR collected a total of 265 chicken caeca from the LBMs in Dhaka in 2023-2024. AST was conducted for E. coli isolates against 19 antibiotics at CDIL.

The findings were analyzed using the WHO AWaRe classification. Among the AWaRe categories, 'reserve' category antibiotics found less used in the reporting period. The percentage of isolates resistant to colistin during this surveillance period demonstrated a decreasing trend, likely due to the ban on colistin use in veterinary medicine since 2022.

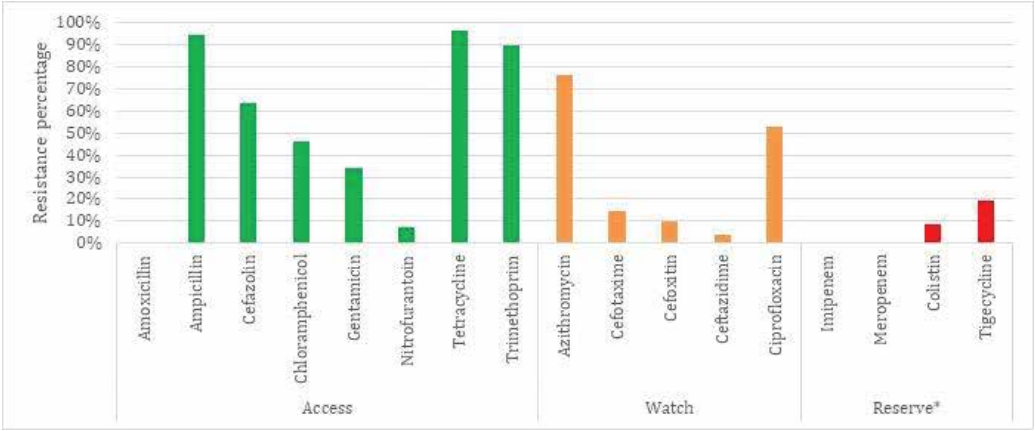


Figure 13: Percentage of resistance to antibiotics in *E. coli* isolates from slaughtered chickens in LBMs according to WHO AWaRe classification

This report underscores the ongoing initiatives of the Epidemiology Unit, Department of Livestock Services, to build a comprehensive AMR surveillance system, supporting evidence-based policymaking and enhancing antimicrobial stewardship in animal health sector of Bangladesh.

The AMR surveillance report of the department can be reached in the following link https://dls.gov.bd/site/page/73798708-4de4-478b-981b-03449678e03f/Surveillance

Activities done by The Bangladesh Livestock Research Institute (BLRI)

BLRI is a Key Point Institution (KPI) in livestock research in Bangladesh under the Ministry of Fisheries and Livestock the Bangladesh Livestock Research Institute (BLRI) has been conducting AMR surveillance in the livestock and poultry value chain system. For the Aquatic health (AqH) sector, Fish Inspection and Quality Control Laboratory (FIQCL), Savar is working as the sentinel laboratory and BLRI has been given the responsibility to work as special NRL-AMR for AqH sector and providing support to FIQCL.

Laboratory Facilities for Antimicrobial Resistance Reference Laboratory: The Animal Health Research Division (AHRD) of BLRI has Four BSL-2 enhance laboratories. Among these, the Antimicrobial Resistance Reference Laboratory (NRL) is the state of the art, fully operational laboratory under the AHRD since 2018.

Title: Elucidating the Antimicrobial Resistance Pathogens Evolution and Combating the MDR (Enteric Pathogens) with Bacteriophage in Companion and Farm Animals

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Summary

Antimicrobial resistance (AMR) is a global threat and considered a silent pandemic. This study aimed to explore the AMR pattern in companion and farm animals, effect of urbanization on AMR development and spreading, and to uncover the possible mechanisms of antimicrobial resistance gene (ARG) across different locations.

Feco-rectal and environmental samples were collected from urban and non-urban regions of Dhaka, Barishal, and Sylhet districts of Bangladesh during July 2023-June 2024. Microbiological and molecular assays including growth characteristics on selective agar, Vitek-2 and PCR were done to isolate and identify four enteric bacterial pathogens, *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa and Enterococcus faecalis*. Antimicrobial sensitivity test (AST) was performed following the protocol of CSLI-2020. ESBL (Extended Spectrum Beta

Lactamase) producing characteristics were tested using double disc synergy test (DDST) and confirmatory combination disc test. The genotypic resistance and the mobile genetic elements (MGEs) like class 1 integron and plasmids were detected using multiplex PCR.

A total of 508 feco-rectal and environmental samples (cats=160, dogs=20, environments linked to companion animals' hospitals=12, cattle=230, and farm environments=86) were collected.
The overall prevalence of *E. coli* was highest and *P. aeruginosa* was lowest. The phenotypic resistance patterns indicated that a proportion of *E. coli* (33.33%), *K. pneumoniae* (56.87%), *E. faecalis* (53.57%), *P. aeruginosa* (16%) were multi-drug resistant (MDR). Among all the resistant isolates, 5% *E. coli* and 2.29% *K. pneumoniae* were ESBL producer.

The sensitivity test result showed that the *E. coli* isolated from cattle, cat, dog and their surrounding environments were 100% sensitive towards Amikacin, Ertapenem , Cefoparazone , Piperacillin and Fosfomycin , and 100% intermediate resistant to Colistin , whereas *K. pneumoniae* from cattle, cat, dog and their related environment were 100% sensitive towards Cefepime , Tigecycline . In the case of *P. aeruginosa* and *E. faecalis* showed highest resistance against Tigecycline (75%) and Cefuroxime.

The genotypic results exhibited that the highest prevalence of blaCTX-M (73.81%) in *E. coli*, whereas *K. pneumoniae* horbours blaCTXM (81.68%). The genes blaCTXM (46.42%) were carried by in *E. faecalis*, while mcr 1 (20.00%) was detected in *P. aeruginosa*. The prevalence rate of class 1 integron and plasmid (IncQ) were 43.75% and 40.62%, respectively that were detected in *K. pneumoniae* isolates of farm environments.

To detect the Farm urbanation and AMR relationship, we saw the prevalence of *E. coli, K. pneumoniae, P. aeruginosa* and *E. faecalis* was higher in non-urban farms compared to urban farm In terms of bacteriophages isolation, out of 120 samples, 6 and 4 bacteriophages isolate were showed potentiality to kill *E. coli* and *Salmonella spp*. respectively.

These findings highlight that significant proportion of MDR, ESBL producing bacteria are currently circulating in the studied settings, of them higher prevalent in urban farms compared to non -urban farms that indicates rapid farm urbanization enhances the rise of AMR crisis. Regular monitoring of AMR and managing antibiotics are thus recommended.

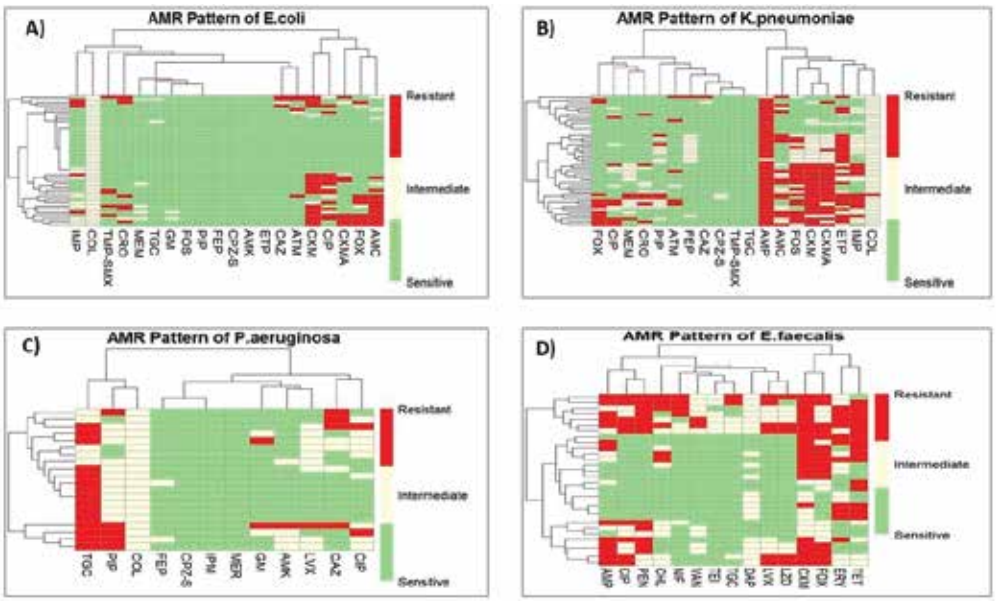


Figure 14: Antimicrobial resistance pattern (Heat map) of isolated bacterial pathogens. Figure A, B, C and D. represents the antimicrobial resistance pattern of *E. coli, K. pneumoniae, P. aeruginosa* and *E. faecalis*, respectively.

Integrated AMR surveillance (TROYEE Study)

A One Health initiative led by the Environmental Health and WASH Group at icddr,b, in partnership with IEDCR, CDC-DGHS, the Department of Livestock Services (DLS), and the Department of Environment (DOE), has launched Bangladesh's first pilot integrated AMR surveillance system in July 2023, entitled "Piloting integration of human, animal and environmental antimicrobial resistance (AMR) surveillance to monitor ESBL-producing *E. coli* using a One Health approach in Bangladesh", backed by the Integrated Health Science Research & Development Fund of the Ministry of Health and Family Welfare (MOHFW). Guided by the WHO tricycle protocol, this initiative targets human, animal, and environmental AMR surveillance within a unified framework. Key objectives include developing an integrated multisectoral AMR surveillance system to detect and estimate the prevalence of ESBL-producing *E. coli*, identifying its transmission pathways through genomic analysis, and assessing factors influencing seasonal variations in resistance trends.

Surveillance activities are focused in Mymensingh and Chattogram metropolitan areas, where IEDCR operates national AMR surveillance sites. Samples are being collected from medical college hospitals for human sector (blood and rectal swabs from pregnant women), from local live bird markets for animal sector (chicken caecum samples), and from five types of wastewater sources for environmental sector. Laboratory analyses are conducted at local medical college microbiology departments, CDIL in Dhaka for animal samples, and icddr,b's Food Safety and One Health Laboratory for environmental samples. Selected ESBL *E. coli* isolates will undergo whole genome sequencing at icddr,b genomic center to map resistant gene profiles and transmission pathways across sectors. To date, icddr,b has hosted three workshops for investigators and stakeholders from government institutions to track project progress. Collaborative efforts with

IEDCR and CDC-DGHS have also included training programs on rectal swab collection for healthcare professionals, ensuring comprehensive preparation for the pilot's implementation. Seven out of twelve months' samples have been collected and analyzed till October 2024, and periodic updates have been shared with the donor and other collaborators. Results from the project aim to estimate the regional burden of multi-drug resistant ESBL *E. coli* and inform policy measures to curb cross-sectoral AMR transmission.

Inauguration of Integrated AMR surveillance in CMCH

Training session for rectal swab collection in MMCH

Antimicrobial Resistance Surveillance in Bangladesh:

Definition of Surveillance

Surveillance is a tool that can facilitate the prevention of infection and the amelioration of its immediate and long-term effects by information for action providing the necessary information for action. (7)

Objectives of surveillance

General Objective

To establish a surveillance system to determine the status of Antimicrobial Resistance among common pathogens in Bangladesh.

Specific Objectives

- To improve the capacity of national and sentinel laboratories conducting AMR surveillance
- To develop standardized Identification and AST of the pathogen from target clinical specimens
- To develop antibiogram periodically
- To support development and update of Standard Treatment Guideline (STG) of infectious diseases)
- To establish networking among participating laboratories
- To establish a national database for AMR by developing a web-based data entry and data sharing system

Case based and Laboratory based AMR Surveillance

National AMR Surveillance was initiated and continued up to 2022 as a case-based surveillance involving mainly public medical colleges and institute. However, In Bangladesh, most microbiological laboratory data is generated from private laboratories located nationwide at the divisional level. The performance and standards of these laboratories vary, with some meeting high standards and others even being accredited.

With the support of the Fleming Fund Country Grant in Bangladesh, IEDCR initiated the inclusion of private laboratories in the surveillance system. This initiative was also supported by CDC DGHS. As a result, quality laboratories were identified and incorporated into the national surveillance system. These laboratories participate in lab-based surveillance, as outlined in the WHO GLASS platform, where laboratory data is primarily used to determine the existing susceptibility patterns of organisms isolated from various samples. The process of incorporating new laboratories into the system is ongoing. Currently, a total of 21 branches from five laboratories are included in this surveillance and evaluation process, with further assessments underway. Only laboratory data from these designated laboratories is provided through this surveillance system. This initiative has integrated private laboratories into the national platform and improved their capabilities through technical support from NRL at IEDCR.

Know more about AMR surveillance in Bangladesh clicking the following link:
National AMR Surveillance in Bangladesh: 2016-2023

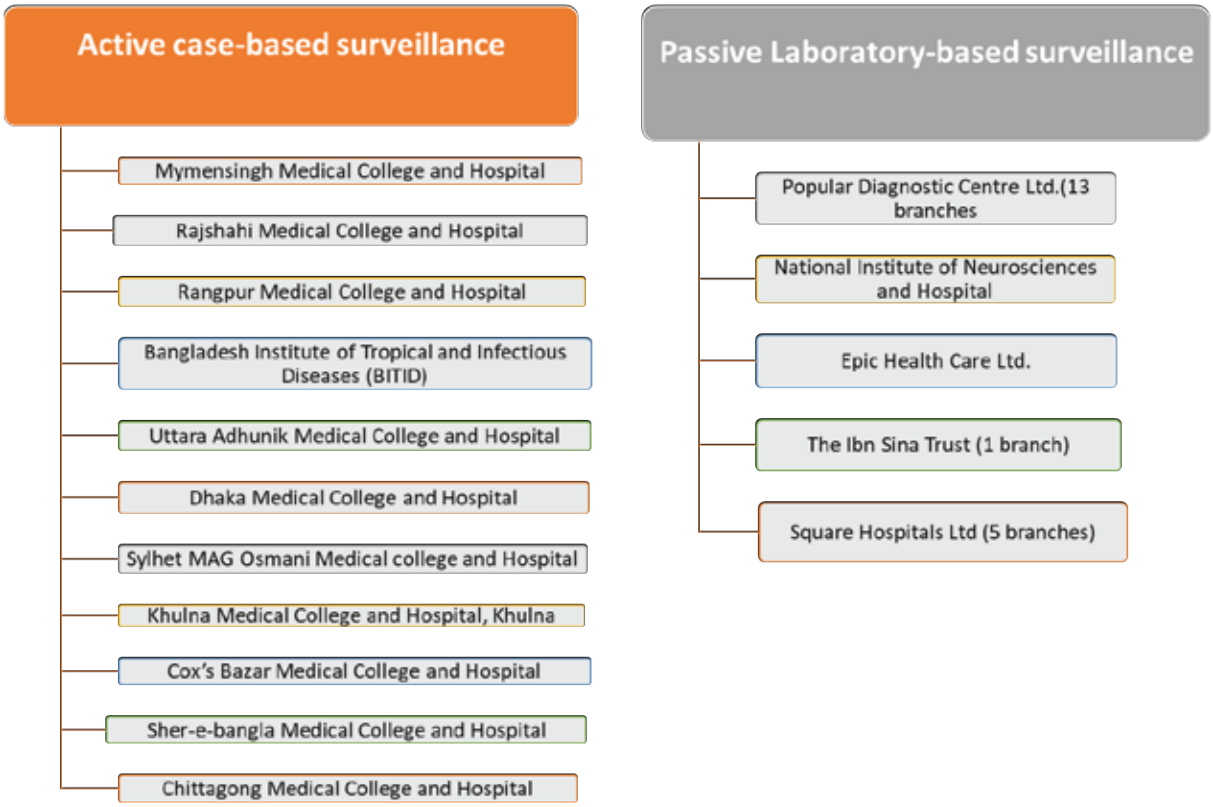


Figure 15: AMR surveillance sites in Bangladesh

National AMR Surveillance Reference Laboratory (NRL)

With the recommendation of the National Technical Committee on AMR containment program and the Director General of Health Services (DGHS) IEDCR has been selected as the AMR surveillance Reference laboratory in 2020. It conducts supportive supervision of the sentinel sites. It provides logistics and equipment support to the sentinel sites. The reference laboratory prepares and updates laboratory Standard Operating Procedure (SOP) and arrange hands on training of laboratory personnel on SOP as well as ensure its implementation. It also provides reference strains for internal quality control to the sites. Perform confirmatory testing for the characterization of AMR that cannot be performed at surveillance sites. It participates in different national and international research activities and gives support to young researchers. Serve as the physical repository for microbial isolates. All the identified bacterial isolates from the sites are sent to the reference laboratory repository where it is preserved for retesting and further research. It collates and analyzes AMR data from respective sites and shares them with Sectoral and National coordination center as well as other stakeholders.

Quality control

The central surveillance team monitors and supervises the sentinel sites to assess their activities and do monthly online meetings with the laboratory personnel. To improve the capacity of the sentinel sites, NRL conducts Training for doctors, nurses, microbiologists, medical technologists and project facilitators. The microbiologists and medical technologists receives hands on training and refresher training who are working at the sentinel sites.

All the laboratory activities at the sentinel sites are performed following SOPs. The SOPs provided by NRL at IEDCR. These SOPs are prepared by NRL with the support from renowned microbiologists of the country following the guidance of CLSI and other reference documents. NRL participates in different international External Quality assurance program like CAP (College of American Pathologist), WHO collaborative center in Thailand. Recently it participated in eight consecutive EQA programs organized by Fleming Fund Regional grant, EQAsia.

Bacterial isolates from the sentinel sites are regularly sent to the central repository at NRL, IEDCR. Quarterly, 5-10% of isolates are retested at NRL, and conduct root cause analysis which is discussed with the sites. Sentinel sites performing internal quality control. NRL also supports the sentinel site laboratories to improve quality management systems. NRL also supports the sentinel site laboratory in participating in the EQA program. NRL is working to establish national EQA Program for all sentinel sites.

Data management

In case-based surveillance project facilitator takes patients epidemiological as well as laboratory data in prescribed format in both hard copy as well as in soft copy in tab. This data also includes clinical symptoms, comorbidity, and antibiotic history data. The data is uploaded in CAMS (Comprehensive AMR Data Management System) software prepared by the IEDCR IT team. This data is readily visible to the central data management team as well as the AMR dashboard on the IEDCR website accessible to all. It helps a clinician to choose the right antibiotic when empirical antibiotic treatment is given to the patient.

At dashboard data can be filtered for site, specimen, or organism or to check their susceptibility pattern both overall and according to different case-based surveillance sites.

Data completeness and regular data upload are monitored centrally. In case of Lab based surveillance only the laboratory-based data from the respective laboratory is collected regularly and made visible for the public through the software.

Beside that to achieve one health true approach the AMR dashboard is recently updated with AMR data from animal health sectors. Data from different animal health laboratories shows the resistance in poultry, cattle, and other species.

CAMS software:

The Comprehensive AMR Data Management System (CAMS) is a hybrid software application designed to gather epidemiological, clinical, and laboratory data from sentinel sites via an Android application. The system analyzes the collected data and presents the results on a web-based dashboard for users. Additionally, the central monitoring team has access to data download features for in-depth analysis. The real-time data transmission system, along with automatically generated reports and a user-friendly report entry panel, significantly enhances the monitoring of the surveillance system.

Web based activities including data visualization in the official IEDCR website

IEDCR has a designated online Dashboard for visualization of the AMR related data. This is public in nature, and anyone can view it. Sentinel site-specific or organism-specific data is also available and has been updated regularly.

The dashboard link is-https://dashboard.iedcr.gov.bd/amr/

AMR Surveillance in Rohingya Population (RP)

This initiative establishes a case-based antimicrobial resistance (AMR) surveillance system targeting 1.4 million Rohingya and host populations across 33 camps in Ukhiya and Teknaf, Cox's Bazar. Utilizing 10 sentinel health facilities, stool, blood, and urine samples will be collected on a weekly basis and tested at the IEDCR Field Laboratory located in Cox's Bazar Medical College. The monthly target for sample collection is 80 urine samples, 40 blood samples, and 80 stool samples. The primary objectives of the surveillance are to monitor AMR trends, promote rational use of antimicrobials, and raise community awareness. WHO, IEDCR, and Cox's Bazar Medical College will jointly oversee the implementation process, including laboratory testing, training, logistics supply, reporting, and monitoring, thereby contributing to both national and global AMR containment efforts. Training and orientation on AMR surveillance were conducted on 24 September 2024, followed by the official inception of surveillance activities in the camps on 25 September 2024.

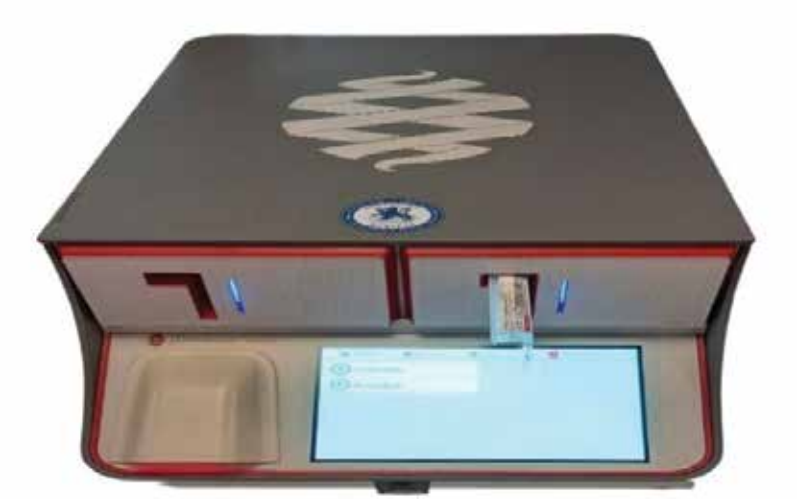
Current Activities of AMR surveillance sites

Current other activities in different sites:

1. **Project Work (Funded by "Integrated Health Science Research") (MMCH)**
   - "Rapid Detection and Molecular Characterization of Carbapenemase Producing Gram Negative Bacilli from Different Clinical Specimens at a Tertiary Care Hospital"
   - "Isolation, Molecular characterization and Determination of Antifungal Susceptibility Patterns of *Candida* species with Analysis of ERG11 Gene from Different Clinical Specimens at a Tertiary Care Hospital"
2. **Integrated AMR surveillance (MMCH)**
   - WHO integrated global surveillance on ESBL-producing *E. coli* using a "One Health" approach: Implementation and opportunities.
3. **Project work by OXFORD (MMCH)**
   - The Burden of Antimicrobial Resistance and Antibiotic Treatment failure in Low, Middle and High-Income countries.
4. **Collaborative study with Sultan Kabul University (Oman) (UAMCH)**
   - A multicentric study promoting antimicrobial and diagnosis stewardship in the management of UTI: an experiment in mentorship to expand a one health concept.
5. **Research with icddr, b (DMCH)**
   - On about the pathogens in environmental samples causing healthcare associated infections. The committee has conducted training about sterilization in regular basis and IPC nurses supervised the area about this purpose.

Best practices related to AMR

- Awareness program regarding antimicrobial susceptibility in central seminar in RpMCH
- Antibiogram distribution to all departments in UAMCH & RpMCH
- **Rodolphe Merieux laboratory (RML)**: This includes Biosafety Level 2 and Biosafety Level 3 laboratories. The laboratory design is based on the standard ISO 14644 part 4 and 1. The laboratory provides patients with quality diagnosis for improved care, performing both routine and specialized testing. Students in clinical biology and infectious diseases receive training at the laboratory, strengthening local capacities. The RML is playing the pivotal role in AMR containment. (BITID)
- **Rapid Diagnostic Tools for Early Detection** such as the Vitek MS prime and FilmArray for identifying bacterial and viral causes of diseases. These tools have significantly reduced unnecessary use of broad-spectrum antibiotics. (BITID)



Biofire Film Array Torch

- **Quality Control (QC) Meetings**: RML staff are actively involved in weekly laboratory QC meetings organized by the laboratory manager. These meetings serve as a platform for reviewing quality control data, discussing ongoing projects, addressing challenges, and implementing corrective actions where needed. It ensures alignment with laboratory best practices and regulatory standards. (BITID)

Quality Control (QC) Meetings in BITID

- **Activities related to ISO 15189:2022: (BITID)**: Continuous improvement is part of the culture here at the laboratory. Our current goal is to obtain ISO 15189 accreditation for BITID Laboratory. For this purpose, the lab manager (head) has completed the SLMTA (Strengthening Laboratory Management toward Accreditation) TOT course organized by US-CDC, and all lab personnel have received training in laboratory QMS and ISO 15189:22. An external audit of the lab has been completed. Phases 1 and 2 of the LQSI (Laboratory Quality Stepwise Implementation) implementation are nearly complete.

Quality Management System (QMS) Training in BITID

Online training on ISO 15189:2022

Regular training and awareness build up workshop among lab personnel in RMCH

Advocacy meeting on AMR

Students visiting BITID Laboratory

Recognition given by Infection Prevention and Control (IPC) Committee

- **Journal Presentation**: It is held in every 6 months in presence of clinicians of all departments and students. (MMCH)
- **Training Programs**: organizes training programs for healthcare professionals, laboratory personnel, medical students (RFST site) and internship for university students on Laboratory procedures, Biosafety & Biosecurity, AMR awareness, prevention, and control measures in BITID.
- Routinely checkup the efficiency of autoclave and hot air oven by using bacillus spore.
- Disk potency test by using ATCC according to updated CLSI.
- Regular training and awareness build up workshop among lab personnel.
- **IPC Committee activity:** Meeting regularly with directorial hospital and other members in MMCH, UAMCH, DMCH & BITID
- IPC nurses who are properly trained about IPC rules, visit the whole hospital for 6 working days and provide the reports in the meeting about the cleaning conditions of the hospital environments, waste management, proper wearing of mask, hand hygiene of health care workers, visitor control, post-operative wound infection rate and their culture sensitivity reports, use of antibiotics, sterilization procedures of Central Sterile Services Department (CSSD) and OT etc. For instance, in DMCH, by changing and implementing some rules, wound infection rate has been reduced from over 40% to around 10% or even less in some wards over last 2 years.
- **Strengthened Hospital IPC Protocols**: The IPC committee has upgraded its Infection Prevention and Control (IPC) protocols and SOPs. This included enhanced training for healthcare workers, awareness program for attendants of the patient, reinforcing sanitation procedures, hand hygiene, and improving isolation facilities for the patients in BITID.
- IPC award to best Hand Hygiene Practicing ward in UAMCH.

AMR related publications of the Sites:

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- Prevalence and antimicrobial susceptibility of ESBL producing isolates National Original article. Bangladesh Co-Author Mymensingh Medical Journal 2013 0ct,22(4),625-631

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Role of development partners in AMR containment of Bangladesh

World Health Organization (WHO)

WHO Bangladesh has been supporting implementing a comprehensive strategy to prevent, detect, and respond to AMR. Outputs include strengthening surveillance, updating guidance documents, enhancing national policy, and monitoring antimicrobial consumption. National AMR Technical Group meetings and guidelines development are part of governance strengthening.

WHO has been supporting National AMR Surveillance system of Bangladesh to:

- Improve and standardize AMR surveillance systems.
- Periodic dissemination of surveillance data at national and subnational levels.
- Develop antibiograms for local and national levels.
- Establish sentinel sites as models for comprehensive AMR containment.

As part of containment efforts, the World Health Organization (WHO) extends its assistance to CDC, DGHS and DGDA in their initiatives to address antimicrobial resistance (AMR). In this context, updated guidance documents and informational resources are accessible for clinicians, laboratories, drug vendors, consumers, as well as animal and agricultural farmers, aiding in the prevention and management of AMR. The strengthening of national policies and governance related to antimicrobial resistance is prioritized, including advocacy for more effective strategies in containing AMR. Additionally, WHO supports activities aimed at enhancing the country's capacity to monitor antimicrobial consumption.

Fleming Fund Country Grant to Bangladesh (FFCGB)

The Fleming Fund Country Grant to Bangladesh (FFCGB) has been working in Bangladesh since 2020. Currently FFCGB is running its second phase from 2024 and to be completed in 2025. FFCGB has been working very closely with the Government counter parts, including Directorate General of Health Services, Department of Livestock Services, Department of Fisheries and the Department of Environment, focused on national AMR surveillance systems strengthening in the human, animal, environment and aquatic sectors. Active and passive surveillance is going on with the support of FFCGB in the human, animal, and aquatic sectors. It also supports strengthening of surveillance of antimicrobial consumption and use in the human, animal and aquatic sectors. It facilitates multisectoral governance of AMR containment with a One Health approach.

In recent years, the Fleming Fund Country Grant has supported and supplemented the government in many activities including Laboratory capacity building with equipment and logistics support in 20 laboratories of human, animal, aquatic and environmental laboratories, improving data management and sharing among the stakeholders, and improving capacity for lab-based surveillance. For improving the laboratory capacity building, FFCGB has been working with National Reference Laboratories (NRLs) including IEDCR and CDIL. There were several engagements with the NRLs including supportive supervision, private sector laboratory engagement, revision of the surveillance strategies and protocols, External Quality Assurance: other laboratory & data management trainings and the Establishment of a Biorepository. FFCGB also assists NRLs with data visualization through online data dashboard. For policy decision

making, FFCGB supports National Focal Point, Sectoral Working Groups to organize meeting at regular basis. To improve clinical engagement FFCGB is committed to support AMS activities in Bangladesh and currently working on Point Prevalence Survey (PPS), National Antimicrobial Prescription Survey (NAPS) and other clinical engagement activities. The technical capacity of Bangladesh on AMR is improving through AMR fellowship scheme. Awareness building is another aspect where Fleming Fund is working specifically during World AMR Awareness Week. Apart from the other activities FFCGB is coordinating and supporting the activities led by other Fleming Fund Regional Grantees who are working in Bangladesh as a part of their regional activities.

Scoping visit for Private Sector Engagement in AMR Surveillance in human health.

The Centers for Disease Control and Prevention, Atlanta, USA (US-CDC)

Through the Cooperative Agreement with GHSA Action Packages (2016-2020) supported by US-CDC, The AMR surveillance in Bangladesh started in 2016. Site selection, SOP development, procurement of logistics and equipment, human resources and all other technical support was provided by this Co- agreement. The project was extended till September 2021 as NOC (No Cost Extension). US-CDC continued supporting National AMR surveillance through SafetyNet including human resources and some other activities.

USAID One Health Activity project (April 2024 -March 2029)

The USAID One Health (OH) Activity project conceived with this approach to strengthen the One health system in Bangladesh and has started implementing the system strengthening activities associated to the following objectives, and the project is being implemented through DAI, Global LLC and its partners agencies (EMPHNET, CVASU, mPower, CNRS) in the country.

Objectives of the USAID One Health Activity project:

Objective 1: Strengthen Systems for Better One Health Governance
Objective 2: Strengthen One Health Disease Detection Systems
Objective 3: Reduce Threats of Antimicrobial Resistance (AMR)

- IR 3.1: National Governance Systems to Regulate and Enforce AMR Standards Strengthened
- IR 3.2: AMR Standards Compliance Increased

Since, May' 2024 onward, as part of the implementation, the USAID One health project implementation team initiated several activities in consultation and collaboration with Government (DGDA, DGHS, CDC, IEDCR) also with development partners like WHO, US CDC, Fleming Fund, UK..

Activities proposed to celebrate the World Antimicrobial Awareness Week (WAAW) 2024:

The planned initiatives include Round Table Discussion and Rally and AMR Awareness Seminar at Government Medical Colleges.

AMR activities and Lab strengthening through Divisional-Level One Health Hub Initiatives:

The USAID One Health activity project /DAI and Fleming Fund Country Grant (FFCG) has been working on AMR and 'One Health Sub-National/ (Divisional Hub) for AMR' which is included in the AMR planning for strengthening AMR related activities at the subnational level. The One Health Divisional hubs may be established in phases first at the division level then gradually to district and upazila level.

AMR week & OH divisional Hub meeting at CDC, 7th Nov 2024

CAPTURA 2 and TACE Projects in Bangladesh

In Phase II, FF Regional Grants Phase II (RGR2) aims to strengthen Fleming Fund Country Grant (FFCGs) by fostering regional coordination and collaboration in quality assurance, data sharing, AMR response strategies, and capacity building in human resources and laboratories.

The CAPTURA 2 and TACE projects aim to strengthen antimicrobial resistance (AMR) surveillance, antimicrobial use (AMU) monitoring, and antimicrobial stewardship (AMS) efforts in Bangladesh through capacity building, data management, and stakeholder engagement.

CAPTURA 2 Project

- Part of the Fleming Fund Regional Grants Phase II (RGR2), CAPTURA 2 focuses on AMR data management, surveillance, and quality assurance.
- Technical support is provided through BWH (WHONET software) and IVI (QAAPT web platform) for AMR data analysis in human health.
- The project includes Hospital National Antimicrobial Prescribing Survey (Hospital-NAPS) in collaboration with the University of Melbourne's NCAS to track antibiotic use.

- Heidelberg Institute of Global Health (HIGH) leads the AMR Surveillance Monitoring and Evaluation (AMRSurME) Framework, ensuring robust data quality.
- SwipeRx Pte. Ltd. spearheads private sector engagement, developing strategies for collaboration in AMR response.

TACE Consortium

- Led by the International Vaccine Institute (IVI), TACE focuses on clinical engagement and infection prevention to mitigate AMR.
- University of Oxford and St. George's University of London are key partners.
- The Clinical Engagement Plan (CEP4AMR) aims to improve early diagnostics, IPC, and AMS in Low-Middle Income Countries (LMICs).
- Provides technical guidance for AMU monitoring methodologies (e.g., NAPS, WHO, Global PPS).
- Supports data-driven decision-making in tertiary and secondary hospitals for improved antimicrobial stewardship.
- Promotes AMU data integration into policymaking and regional knowledge dissemination through workshops.

Project Inauguration & Workshops

- The CAPTURA 2 and TACE consortium launched the projects on November 4 in Dhaka, gathering key AMR stakeholders.
- A two-day workshop focused on private sector engagement (PSE) and the AMR Surveillance Monitoring and Evaluation (AMRSurME) framework, ensuring local alignment and stakeholder contributions.

These initiatives mark a significant step towards strengthening AMR surveillance and antibiotic stewardship in Bangladesh through data-driven policies, healthcare engagement, and strategic partnerships.

CAPTURA2 and TACE Inauguration and Workshops in Bangladesh, The Hotel Amari, Dhaka

Results

This report presents data collected between July 2023 and June 2024, encompassing 84,098 patients and 71,269 isolates. Of these isolates, 3,377 (4.97%) were obtained through case-based surveillance, while the remaining 67,892 were collected via laboratory-based surveillance.

Case-based surveillance

In case-based surveillance, a total of 16,206 samples were tested, resulting in 3,377 isolates.

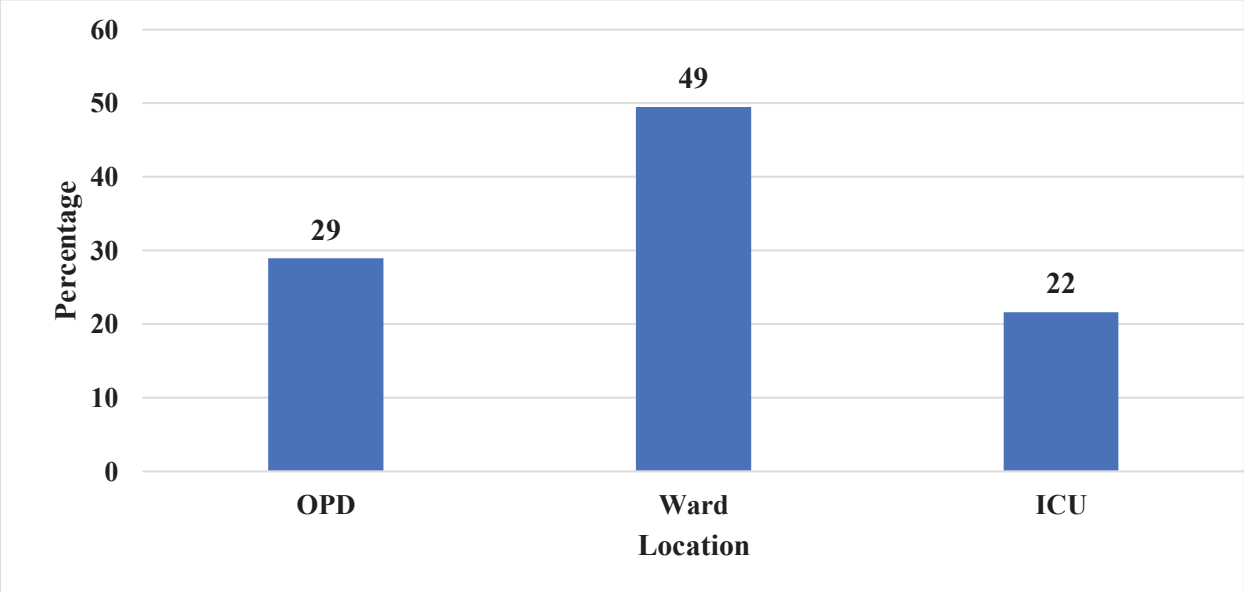


Figure 16: Distribution of patients (n=16,206)

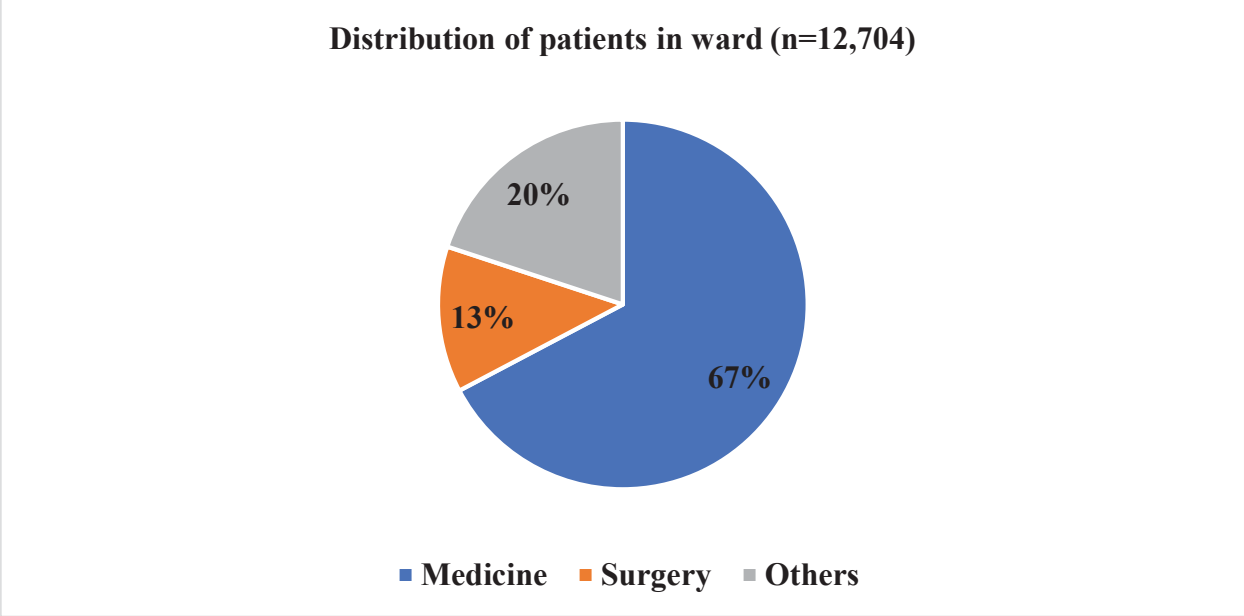


Figure 17: Distribution of patients in ward

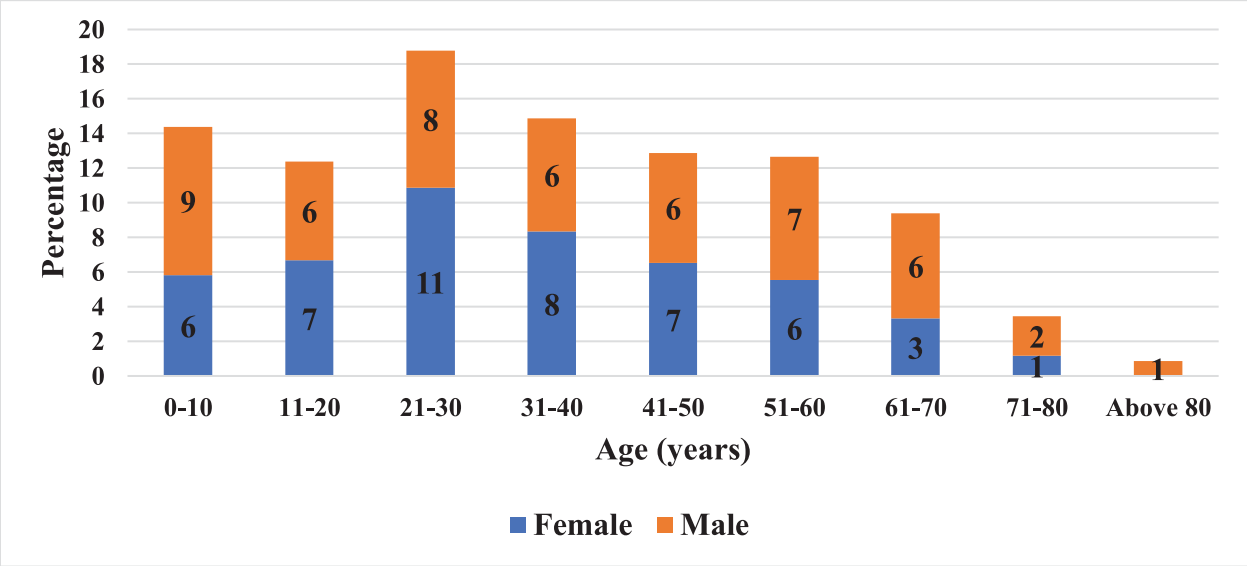


Figure 18: Distribution of patients according to age and sex (n=16,200)

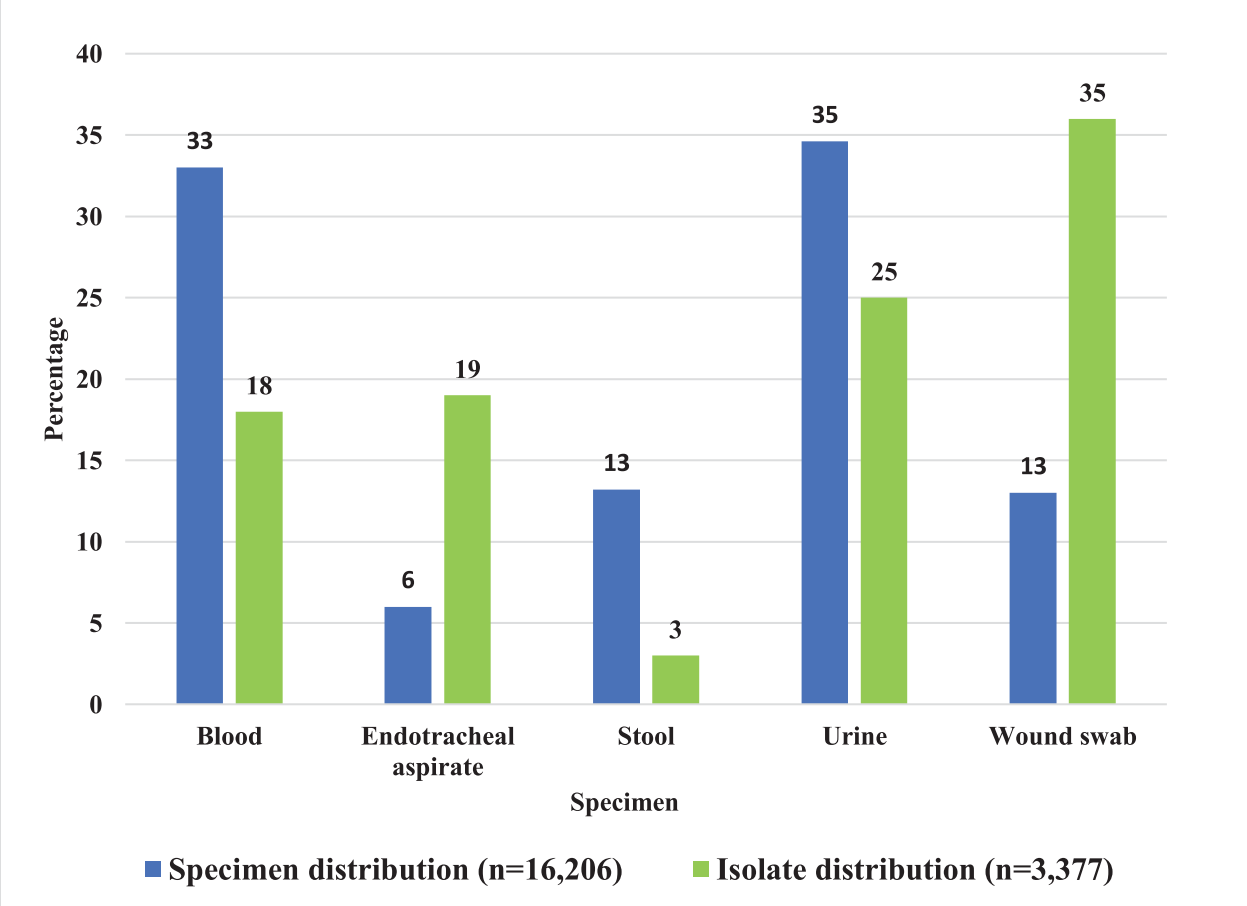


Figure 19: Distribution of sample (n=16,206) and isolates (n=3,377)

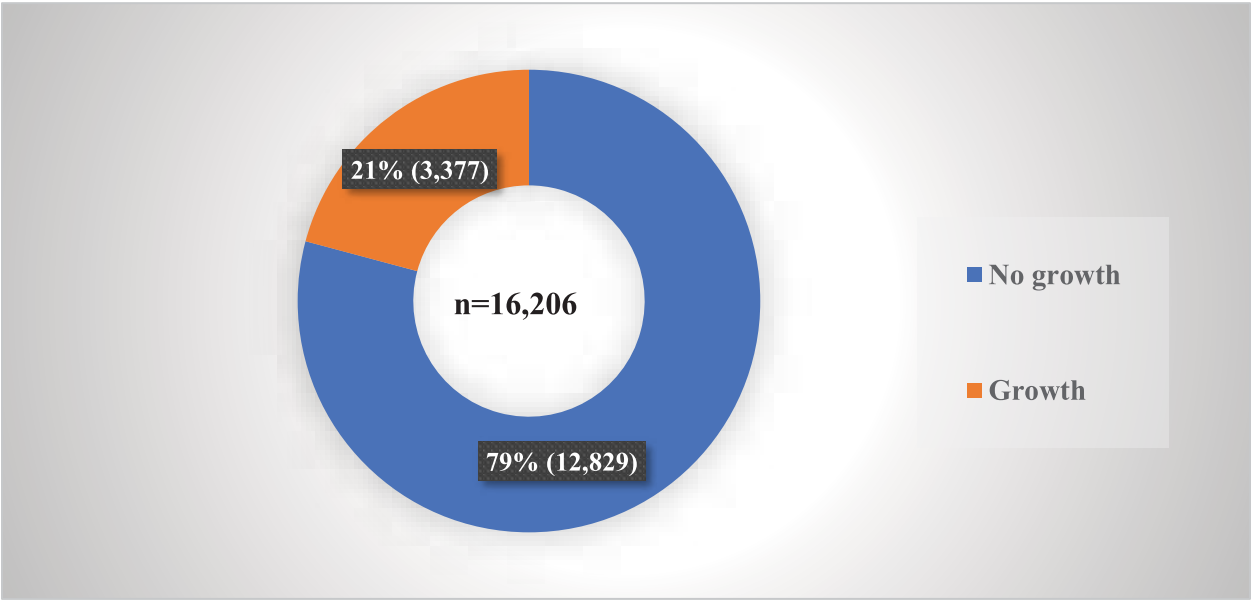


Figure 20: Distribution of yield of Culture

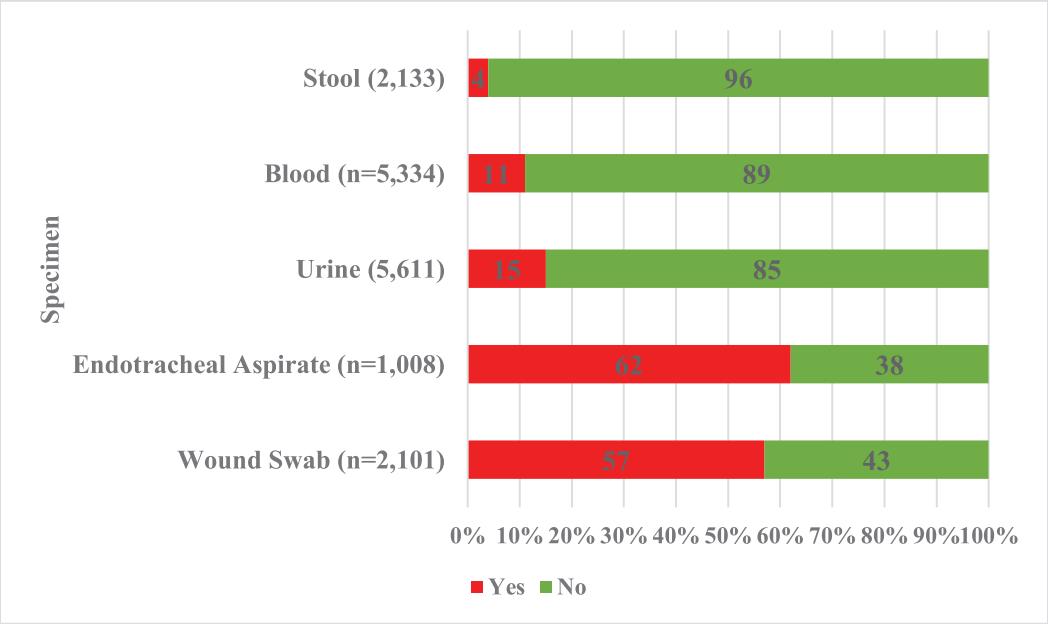


Figure 21: Distribution of growth in cultured specimens (n=16,206)

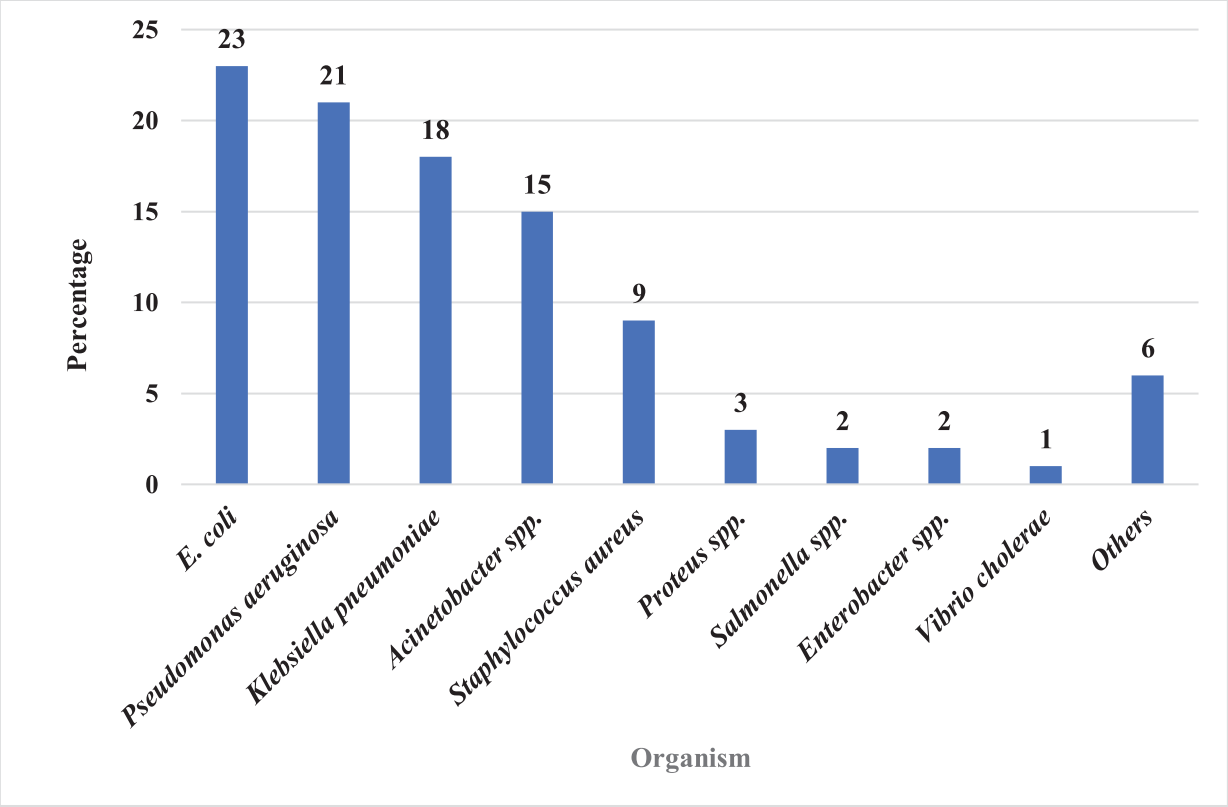


Figure 22: Distribution of bacterial growth in cultured positive specimen (n=3,377)

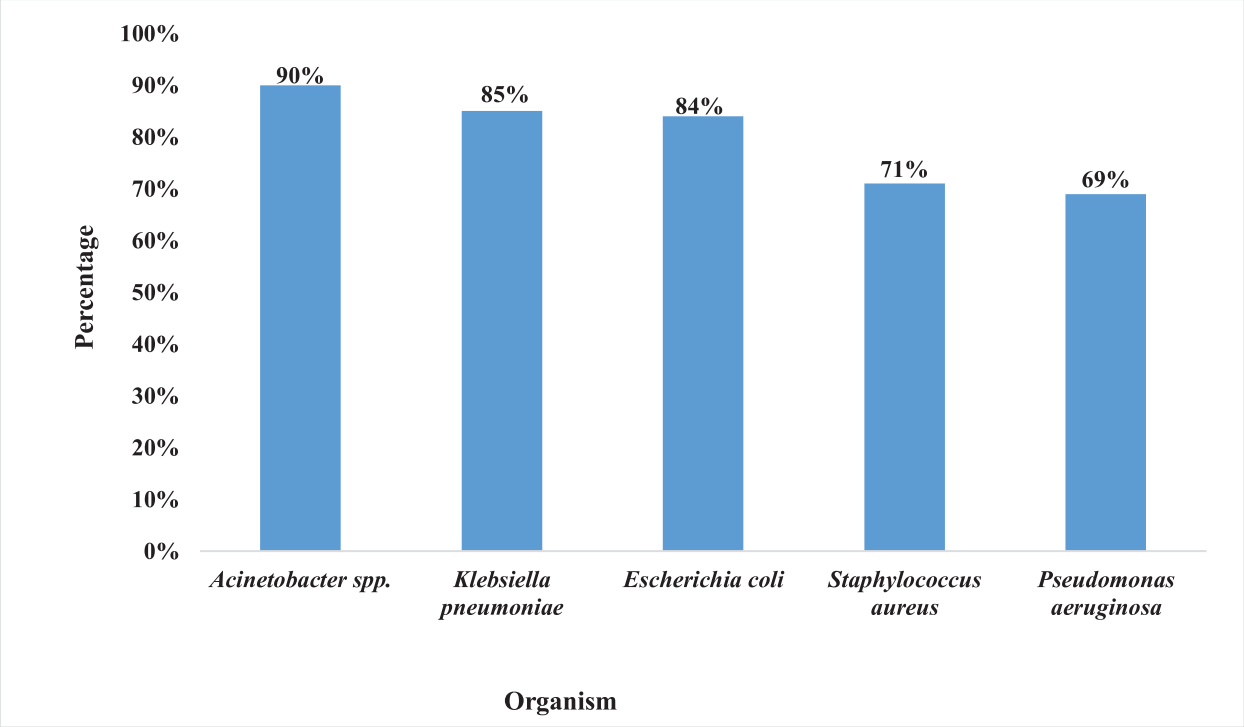
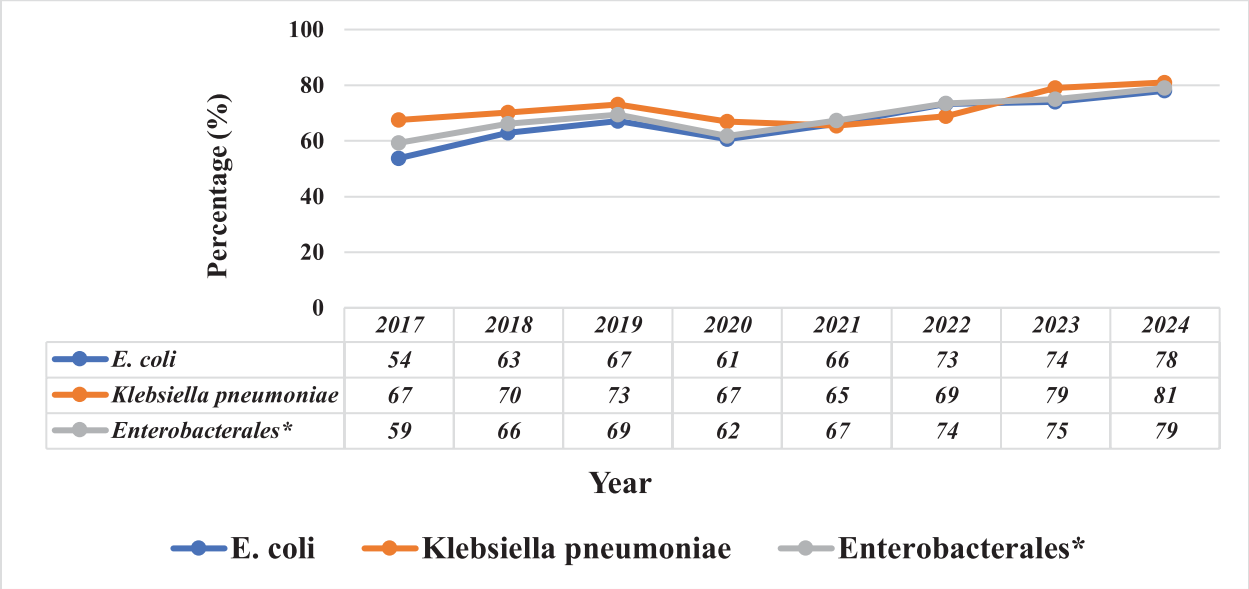


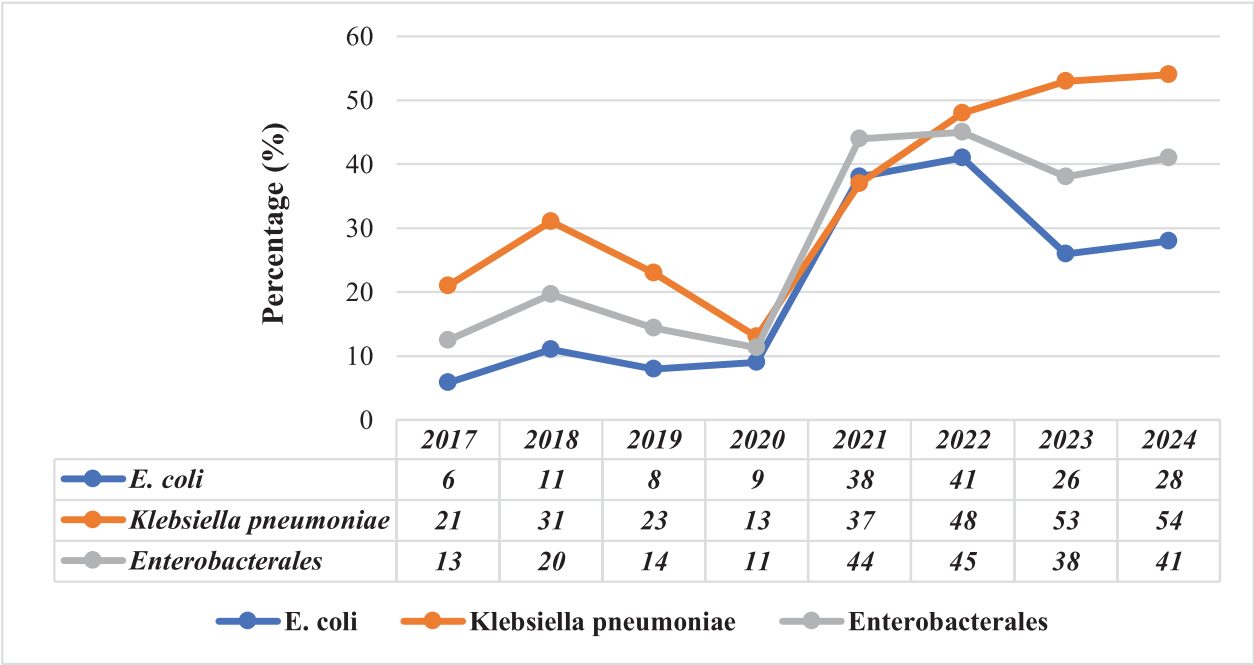
Figure 23: Distribution of MDR bacteria



	2017	2018	2019	2020	2021	2022	2023	2024
E. coli	54	63	67	61	66	73	74	78
Klebsiella pneumoniae	67	70	73	67	65	69	79	81
*Enterobacterales**	59	66	69	62	67	74	75	79

***Enterobacterales: *E. coli, Klebsiella pneumoniae, Proteus* spp., *Enterobacter* spp.**

Figure 24: Resistance Trends of WHO Critical Priority Pathogens (3GRC)



	2017	2018	2019	2020	2021	2022	2023	2024
E. coli	6	11	8	9	38	41	26	28
Klebsiella pneumoniae	21	31	23	13	37	48	53	54
Enterobacterales	13	20	14	11	44	45	38	41

Figure 25: Resistance Trends of WHO Critical Priority Pathogens (CRE)

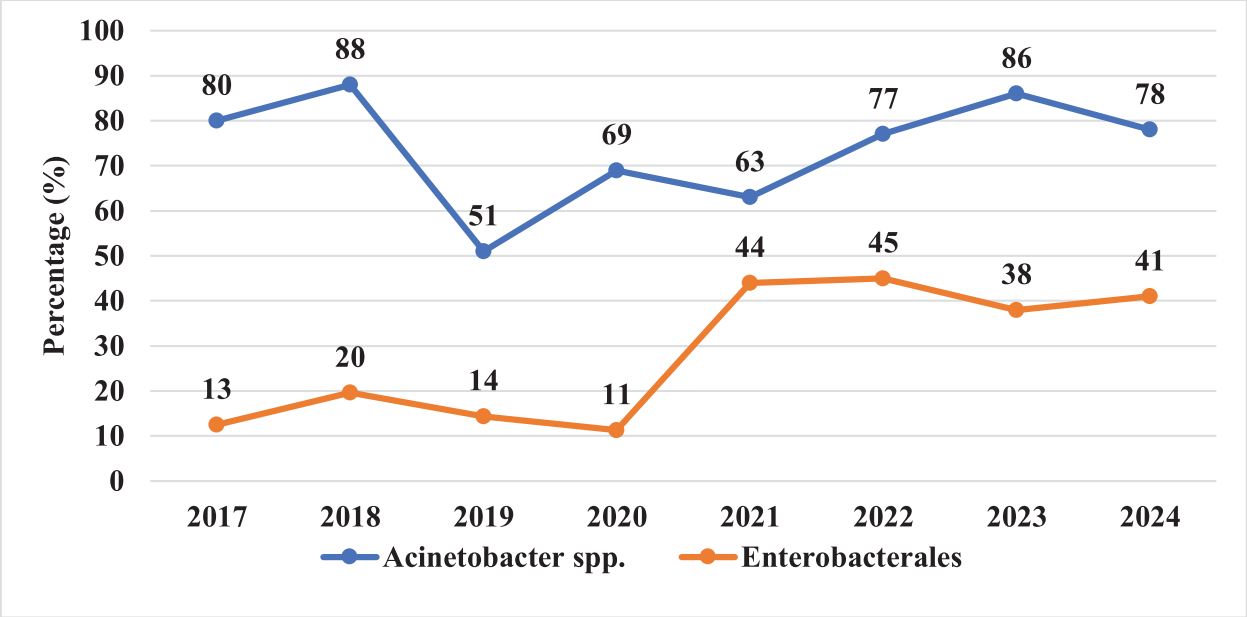


Figure 26: Comparison of resistance Trends of WHO Critical Priority Pathogens (Carbapenem resistant Acinetobacter spp. and Enterobacterales)

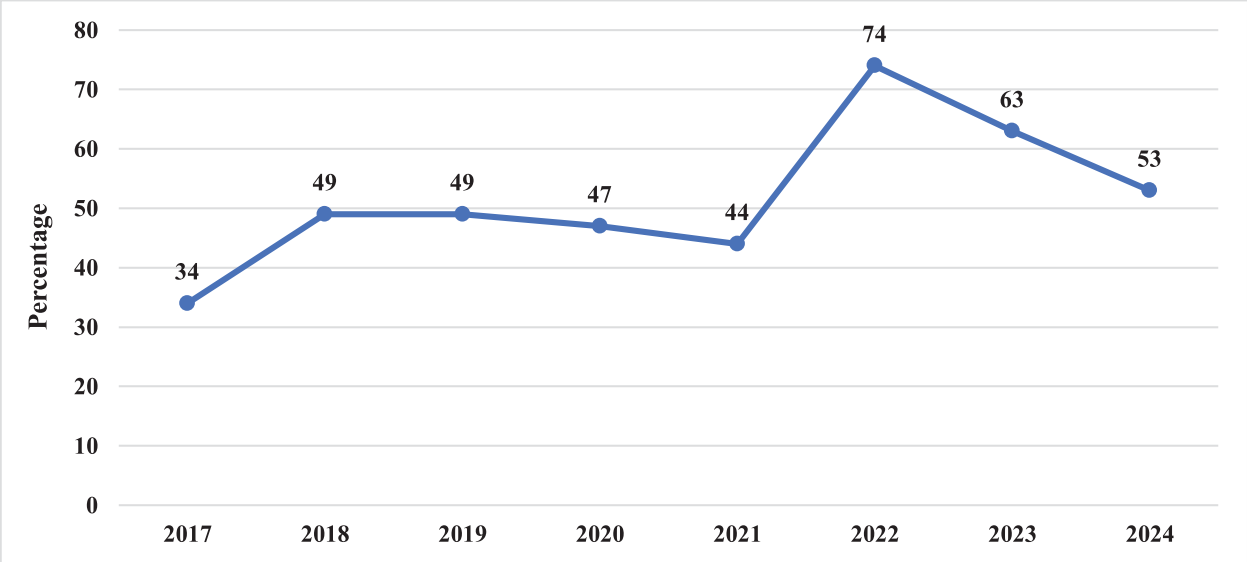


Figure 27: Resistance Trends of WHO High-Priority Pathogen (Pseudomonas aeruginosa) (CRPA)

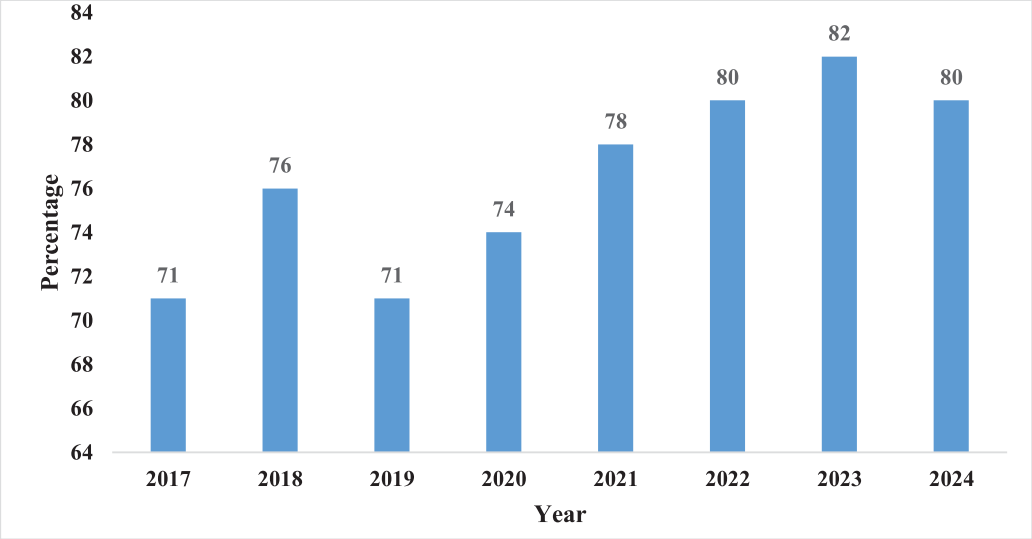


Figure 28: Yearly trend of MDR (2017-2024)

Table 01: MDR summary in different organism

Organism	MDR n (%)	N
Staphylococcus aureus	228 (71%)	320
Acinetobacter sp.	468 (90%)	519
Escherichia coli	644 (84%)	763
Klebsiella pneumoniae	527 (85%)	621
Pseudomonas aeruginosa	481 (69%)	701

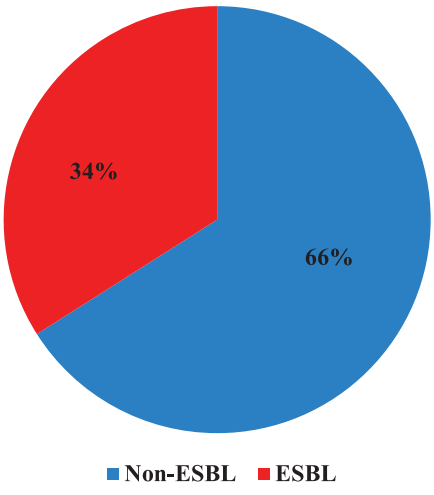


Figure 29: ESBL producing *E. coli* in blood (n=41)

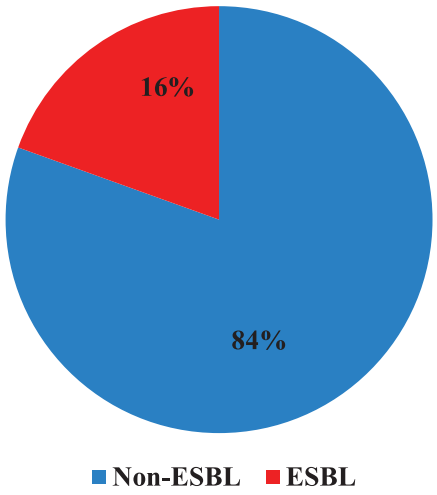


Figure 30: ESBL producing *Klebsiella pneumoniae* in blood (n=45)

Table 02: Antibiotic Susceptibility Profile of *E. Coli* in different locations

Antibiotic name	ICU	Indoor	Outdoor
Amoxiclav	11	19	26
Amikacin	25	54	55
Amplicillin	0	2.39	8
Aztreonam	7	17	35
Ceftazidime	9	13	34
Ciprofloxacin	5	18	29
Cefepime	5	20	40
Ceftriaxone	8	14	37
Cefuroxime	2	3	9
Gentamicin	46	60	65
Imipenem	56	71	86
Meropenem	53	57	79
Piperacillin Tazobactum	20	35	55
Tetracycline	64	44	57
Cefixime	9	11	21
Fosfomycin*	100	86	95
Nitrofurantoin*	71	68	76
Cefazolin	-	-	15
Trimethoprim-Sulfamethoxazole	31.2	32.2	43

Urine only

Table 03: Antibiotic Susceptibility Profile of *Klebsiella pneumoniae* in different locations

Antibiotic name	ICU	Indoor	Outdoor
Amoxiclav	4	13	33
Amikacin	18	40	56
Aztreonam	6	24	48
Ceftazidime	5	19	44
Ciprofloxacin	5	20	39
Cefepime	4	24	49
Ceftriaxone	3	20	46
Cefuroxime	1	7	19
Gentamicin	23	45	67
Imipenem	26	57	73
Meropenem	21	46	67
Piperacillin Tazobactum	9	24	48
Tetracycline	39	45	62
Cefixime	-	9	-
Nitrofurantoin	-	40	36
Trimethoprim-Sulfamethoxazole	13	32	52
Tobramycin	22	65	-

Table 04: Antibiotic Susceptibility Profile *Proteus* spp. Isolates in Indoor*

Antibiotic name	Indoor
Amoxiclav	26
Amikacin	53
Aztreonam	45
Ceftazidime	36
Ciprofloxacin	47
Cefepime	39
Ceftriaxone	38
Gentamicin	53
Imipenem	47
Meropenem	54
PiperacillinTazobactum	46
Trimethoprim-Sulfamethoxazole	37

Sample size was less than 30 in ICU and Outdoor

Table 05: Antibiotic Susceptibility Profile of *Pseudomonas aeruginosa* in different locations

Antibiotic name	ICU	Indoor	Outdoor
Aztreonam	27	35	32
Ceftazidime	22	25	26
Cefepime	30	28	30
Ciprofloxacin	25	37	45
Imipenem	36	48	50
Meropenem	33	36	67
PiperacillinTazobactam	26	38	47

Table 06: Antibiotic Susceptibility Profile of *Salmonella* Typhi Isolates in Indoor *

Antibiotic name	Indoor
Ampicillin	81
Azythromicin	48
Ciprofloxacin	1
Ceftriaxone	97
Levofloxacin	75
Meropenem	97
Trimethoprim-Sulfamethoxazole	87

Sample size was less than 30 in ICU and Outdoor

It is not included in CLSI. Zone diameter in is EUCAST

Table 07: Antibiotic Susceptibility Profile of *Acinetobacter* spp. in different locations*

Antibiotic name	ICU	Ward
Amikacin	9	20
Cefepime	6	16
Ceftazidime	6	15
Ceftriaxone	2	10
Ciprofloxacin	7	17
Doxycycline	26	43
Gentamicin	9	26
Imipenem	7	34
Meropenem	6	24
Piperacillin Tazobactam	5	20
Trimethoprim-Sulfamethoxazole	15	31

Sample size was less than 30 in Outdoor

Table 08: Antibiotic Susceptibility Profile of *Staphylococcus aureus* in different locations

Antibiotic name	ICU	Indoor	Outdoor
Azythromicin	11	23	-
Oxacillin	12	33	47
Ciprofloxacin	18	34	46
Clindamycin	21	63	-
Doxycycline	72	83	80
Gentamicin	43	73	91
Linezolid	67	80	94
Penicillin	2	3	-
Trimethoprim-Sulfamethoxazole	51	54	65

Table 09: Antibiotic Susceptibility Profile of *Vibrio cholera* in Indoor*

Antibiotic name	Indoor
Ciprofloxacin	27
Tetracycline	74
Trimethoprim-Sulfamethoxazole	20

Sample size was less than 30 in ICU and Outdoor

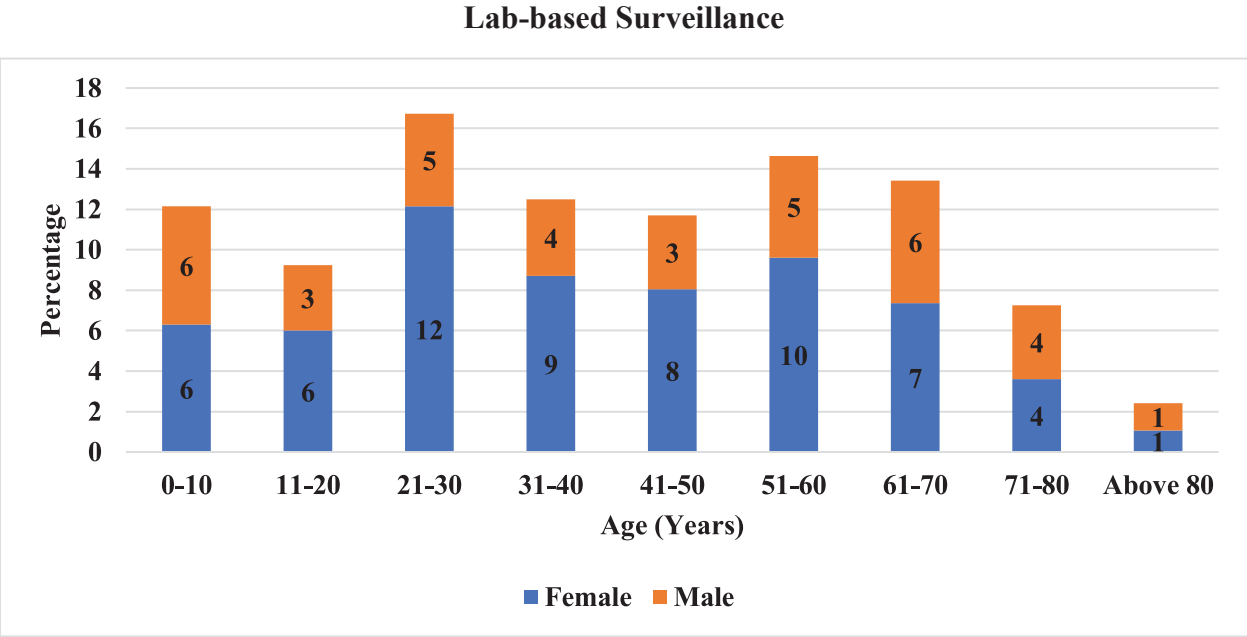


Figure 31: Distribution of patients according to age and sex (n=67,390)

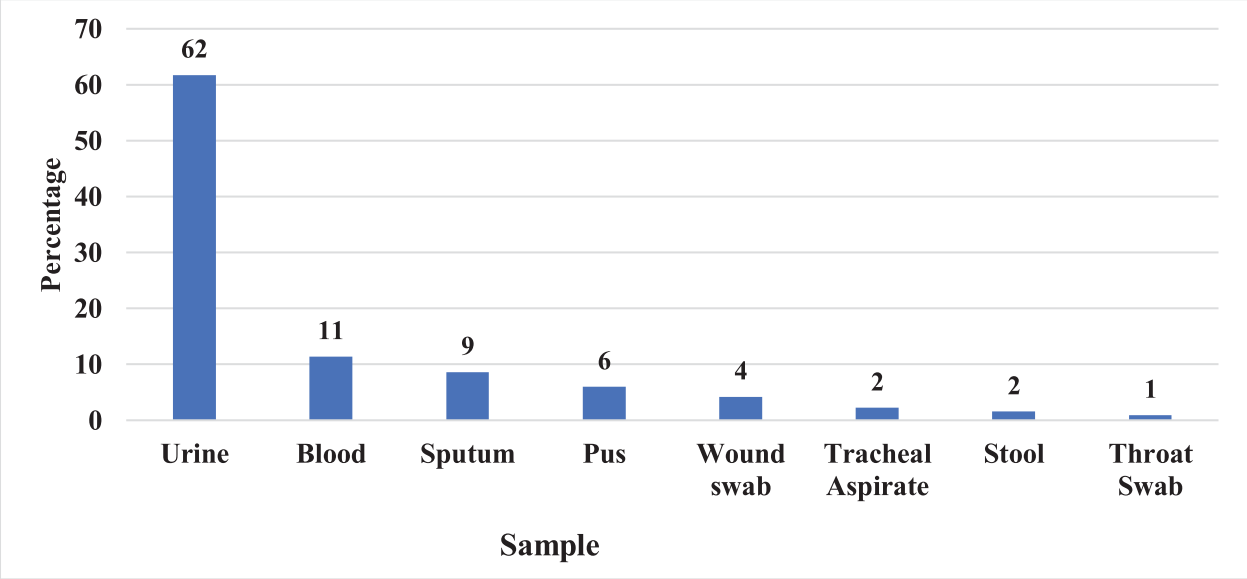


Figure 32: Most frequent positive samples (n=67,892)

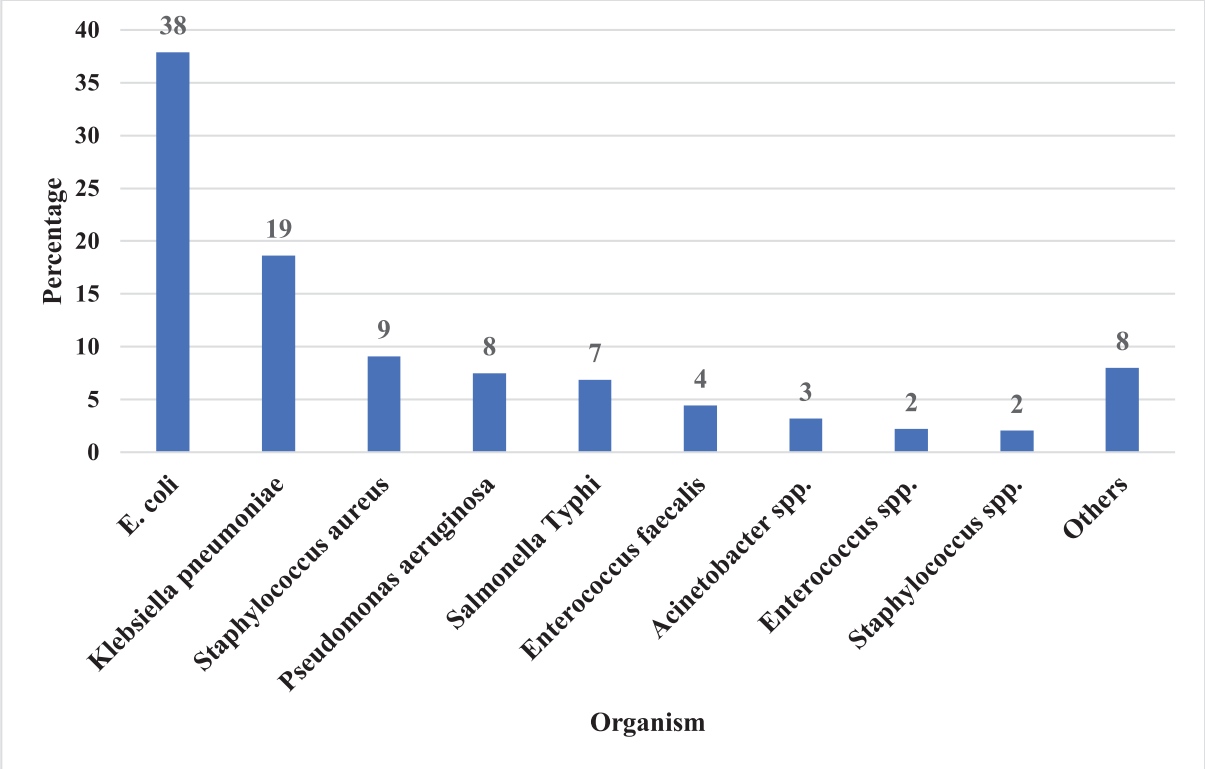
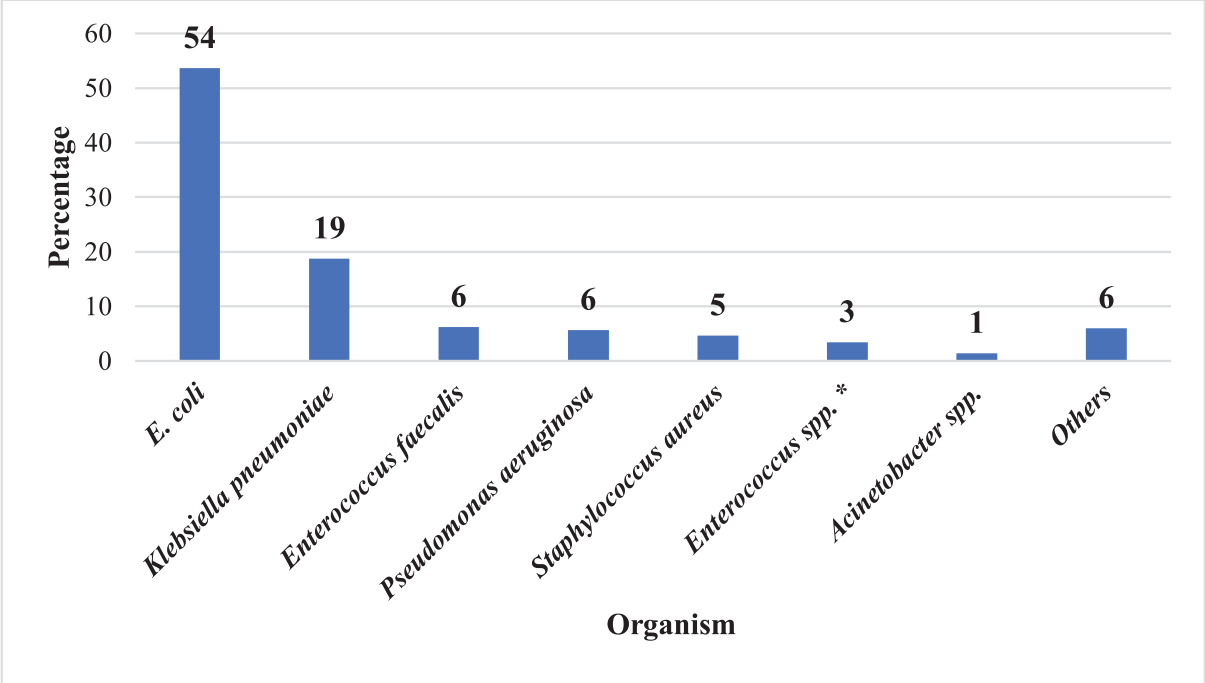


Figure 33: Most frequent organism found in all samples (n=67,892)

Overall analysis from Case based and Lab based surveillance



**Species could not be identified*

Figure 34: Most frequent organisms found in urine (n=42,775)

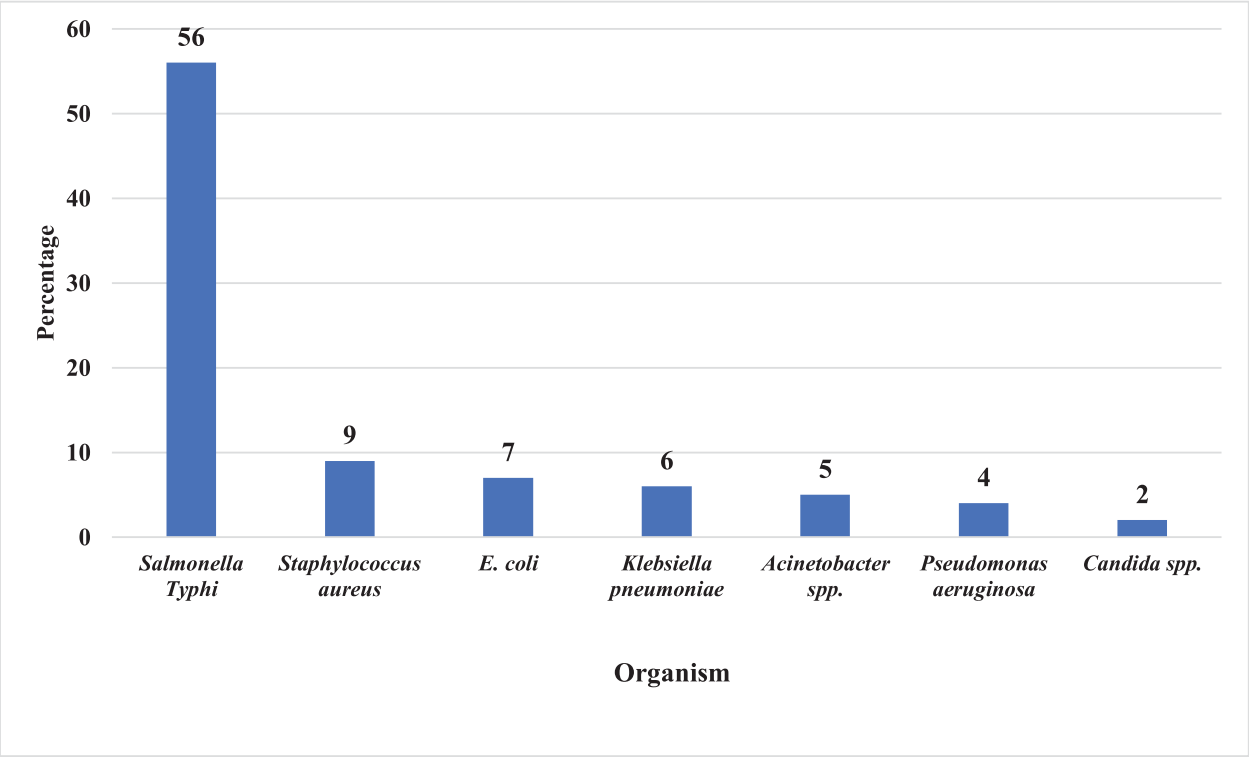
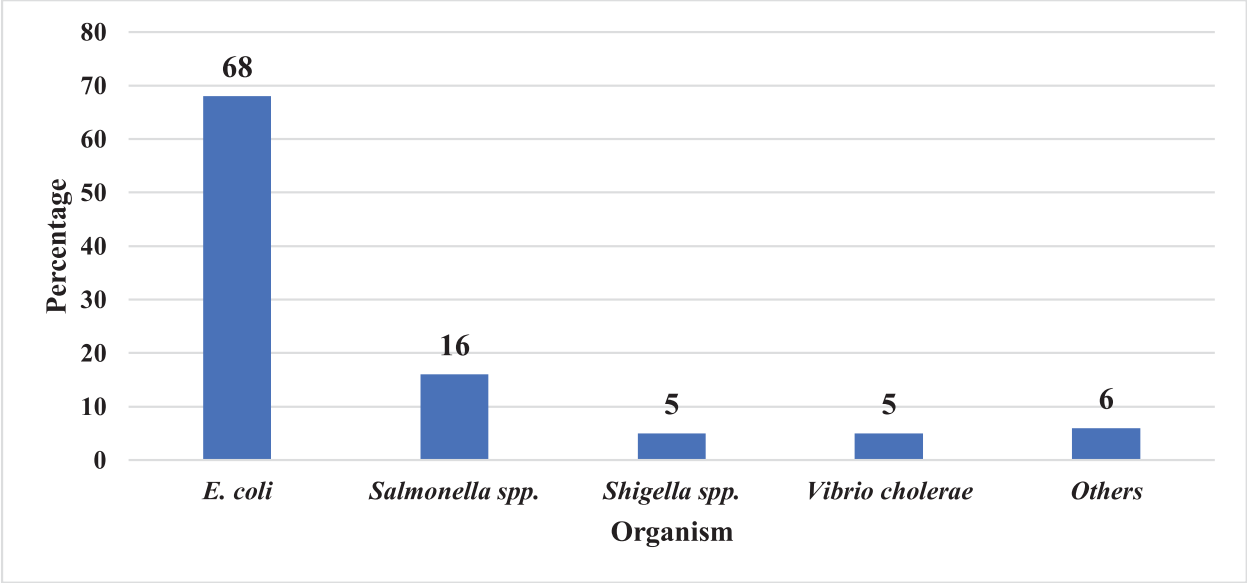


Figure 35: Most frequent organisms found in blood (n=8,322)



** E.coli is not confirmed by pathogenicity test.*

Figure 36: Most frequent organisms found in stool (n=1,136)

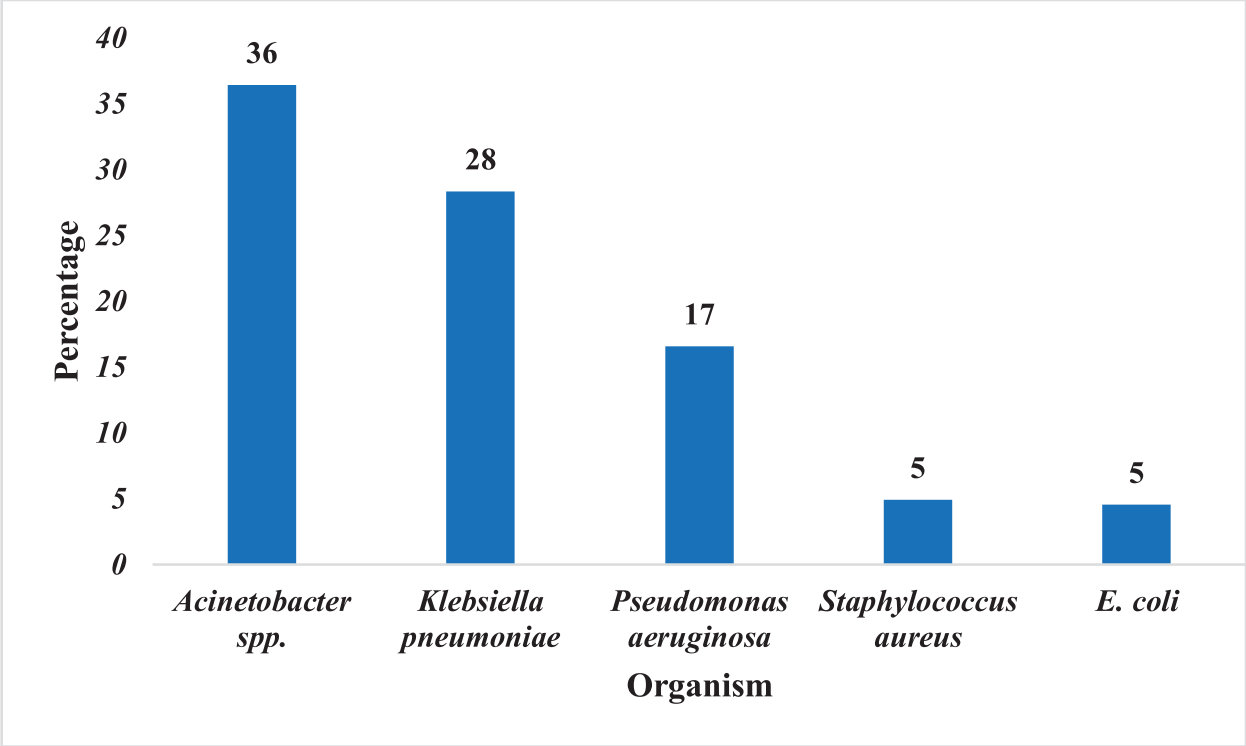


Figure 37: Most frequent organisms found in Endotracheal Aspirate (n=2,142)

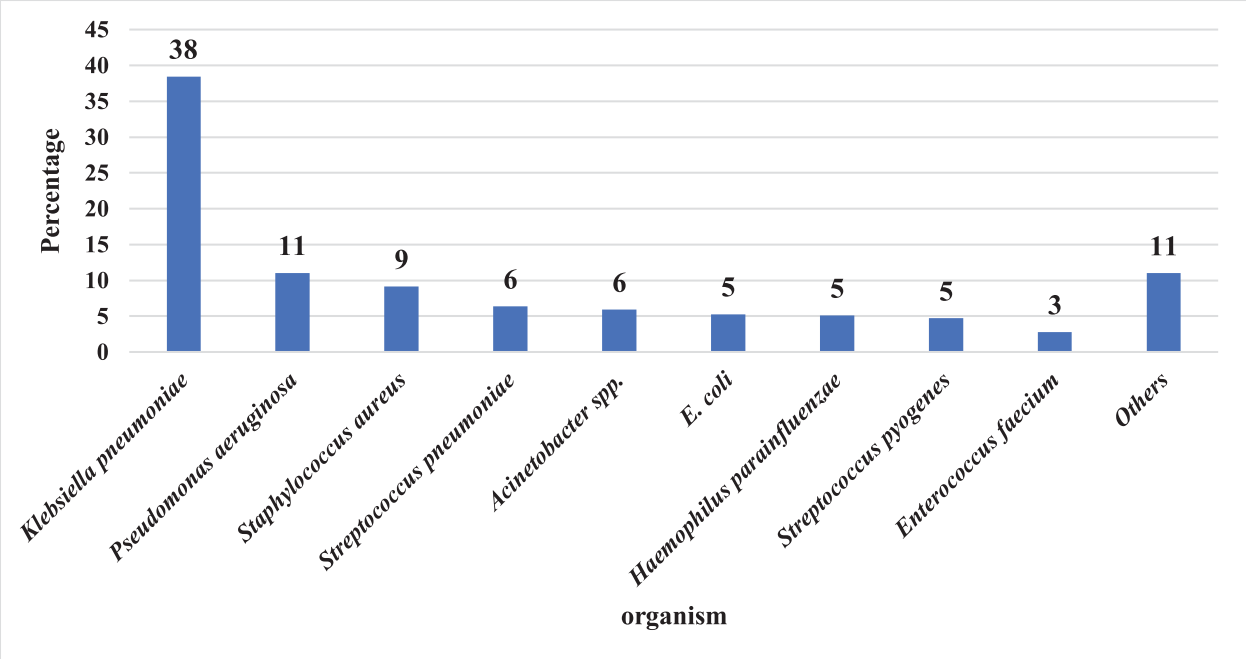


Figure 38: Most frequent organism found in respiratory sample other than Endotracheal Aspirate (n=6,477)

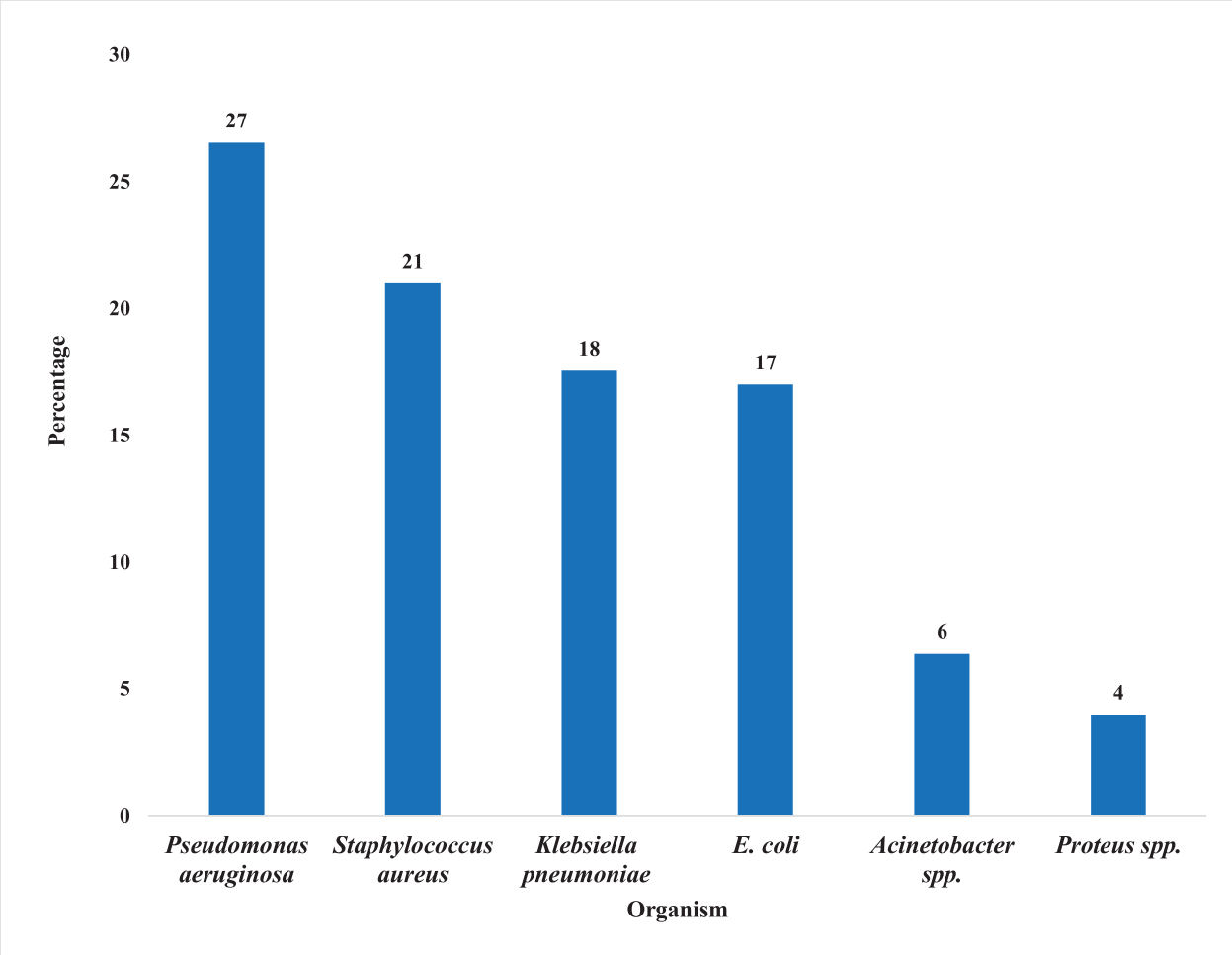


Figure 39: Most frequent organism found in Wound Swab (n=4,006)

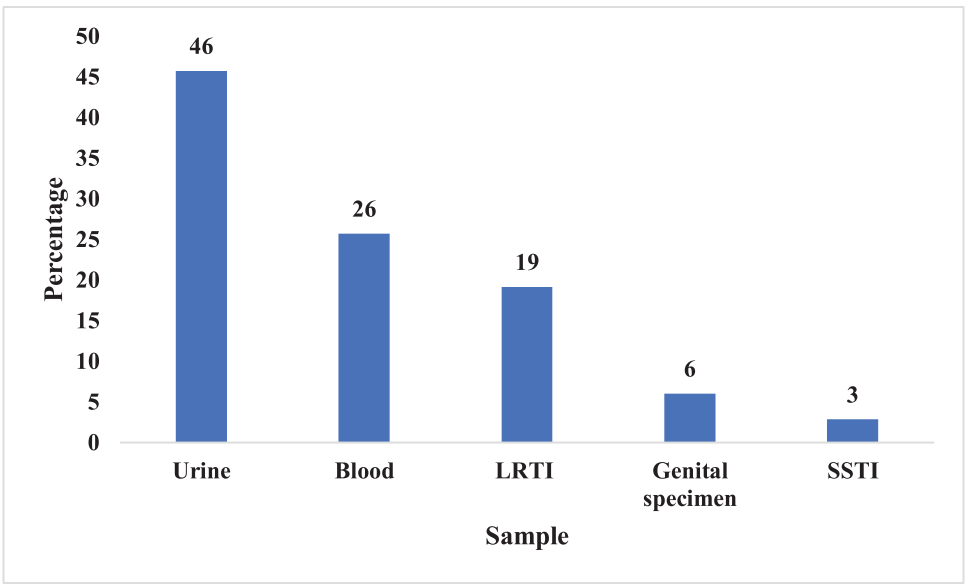


Figure 40: Distribution of *Candida* spp. in culture positive specimen (n=564)

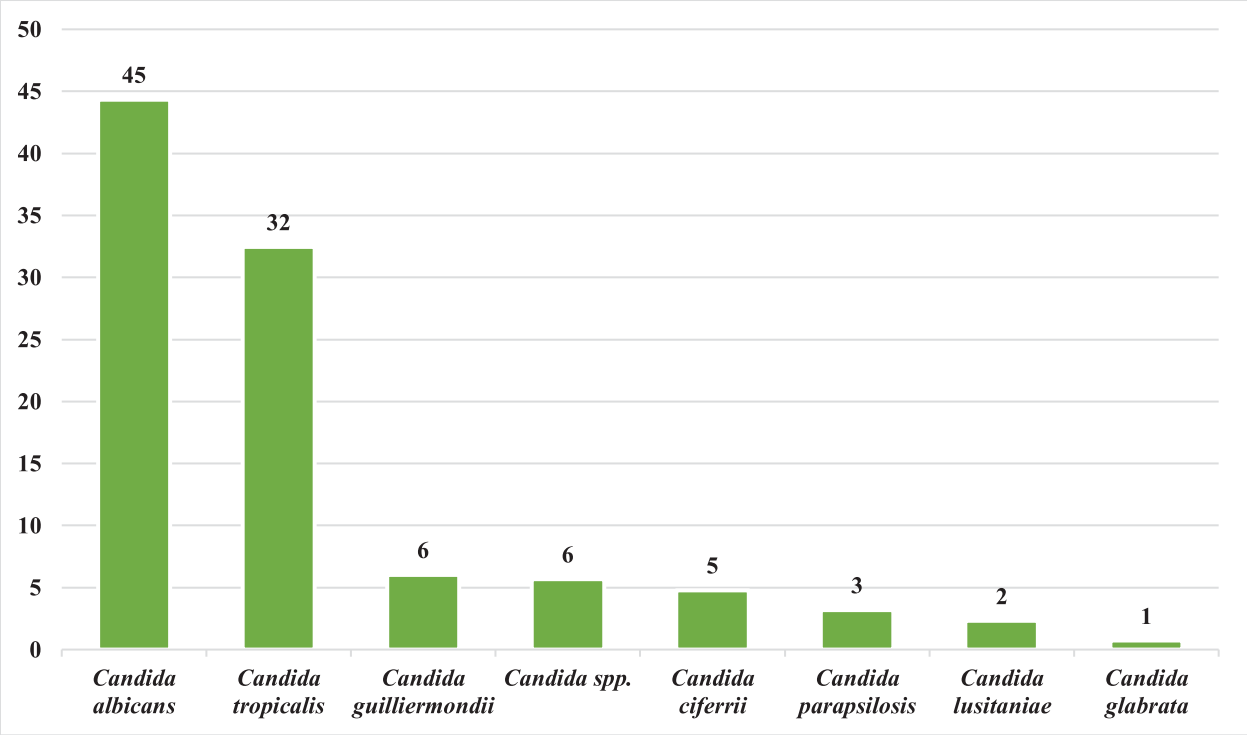


Figure 41: Distribution of *Candida* spp. in different specimens (n=564)

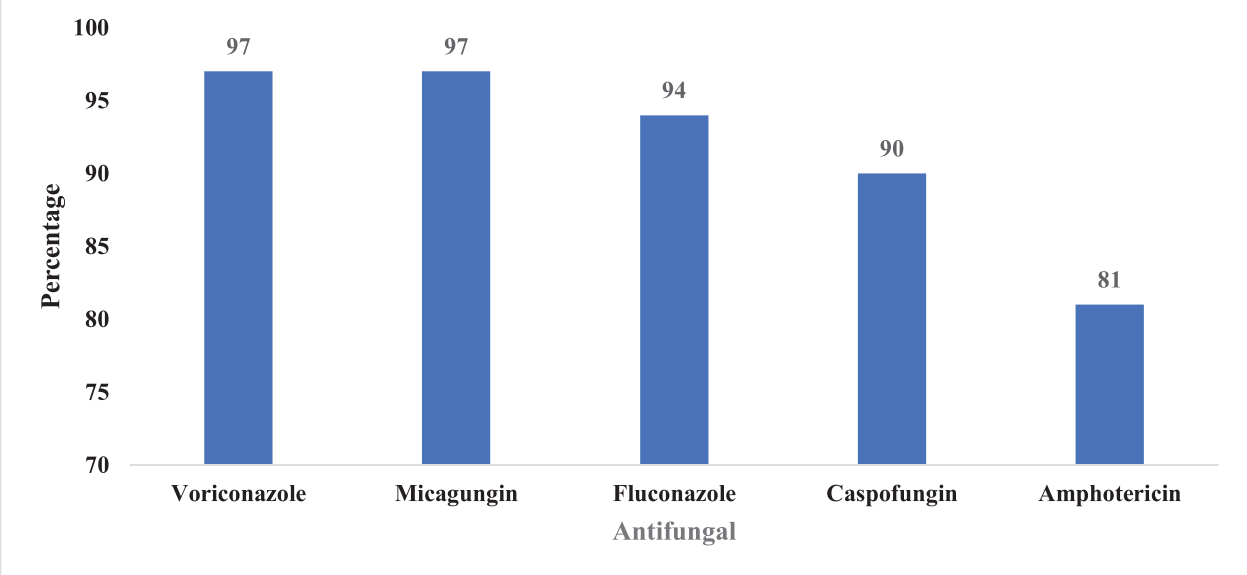


Figure 42: Susceptibility pattern of *Candida albicans* (n=250)

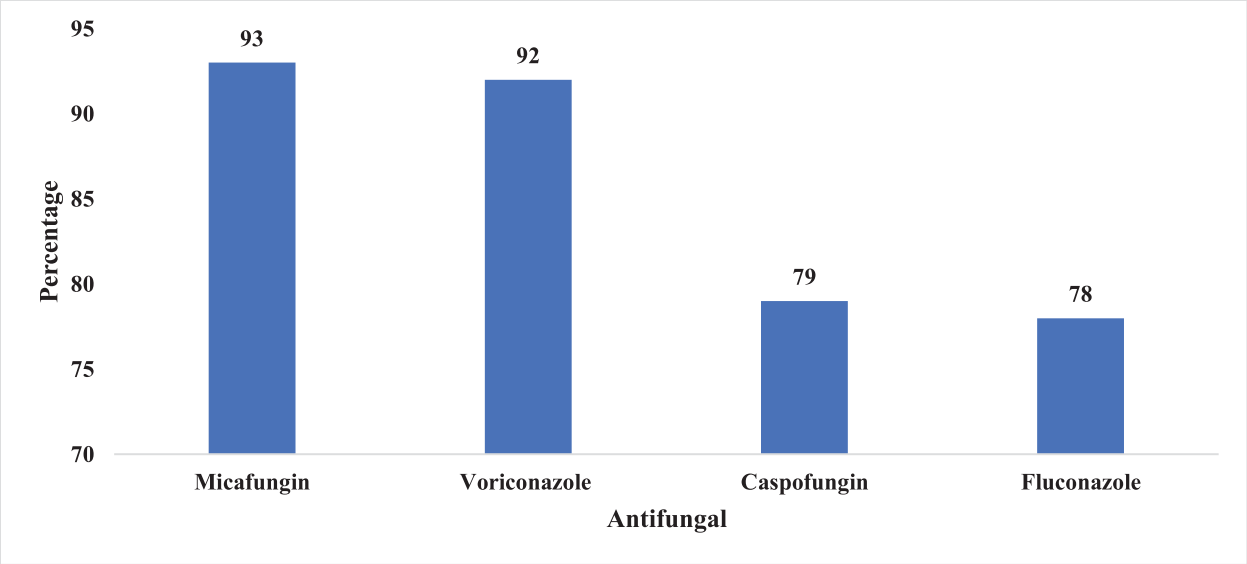


Figure 43: Susceptibility pattern of *Candida tropicalis* (n=183)

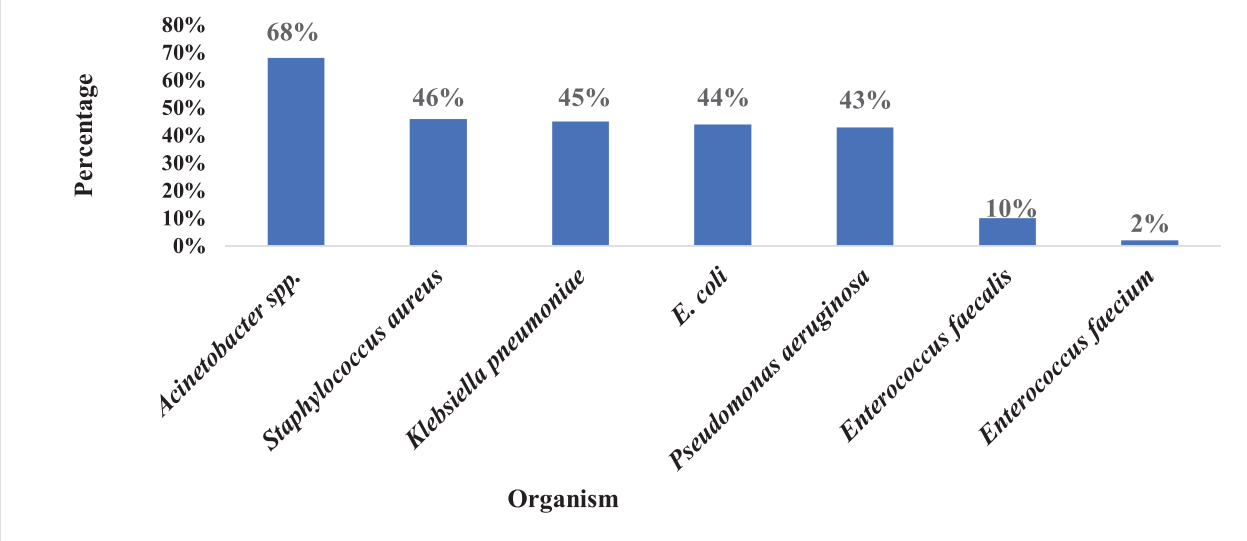


Figure 44: Overall percentage of MDR pathogen found in different organisms

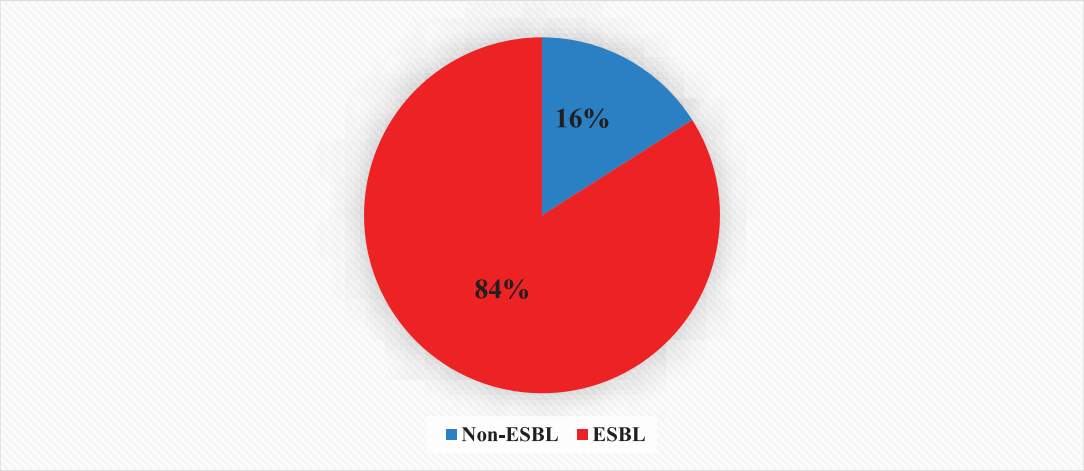


Figure 45: Suspected ESBL producing *E. coli* in blood (n=574) (Third generation cephalosporin resistant *E.coli*)

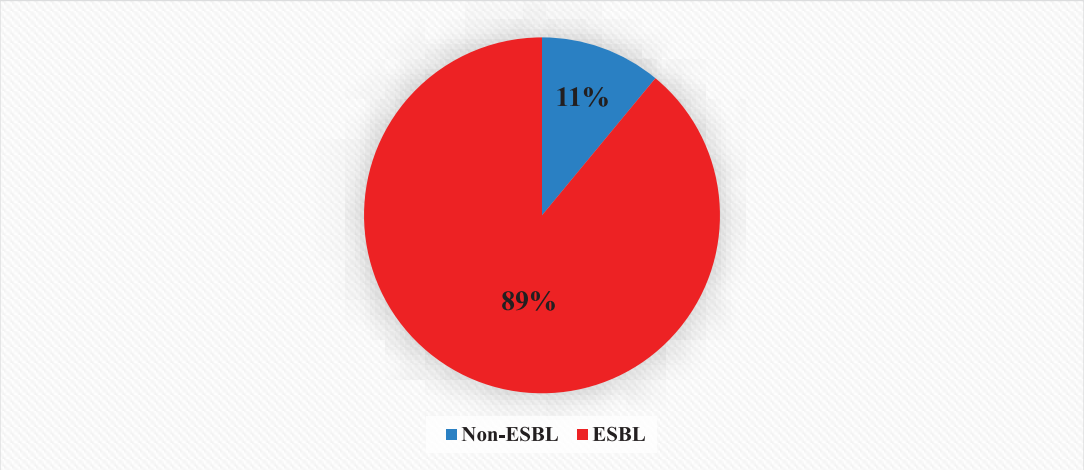


Figure 46: Suspected ESBL producing *Klebsiella pneumoniae* in blood (n=509) according to SDG definition (Third generation cephalosporin resistant *Klebsiella pneumoniae*)

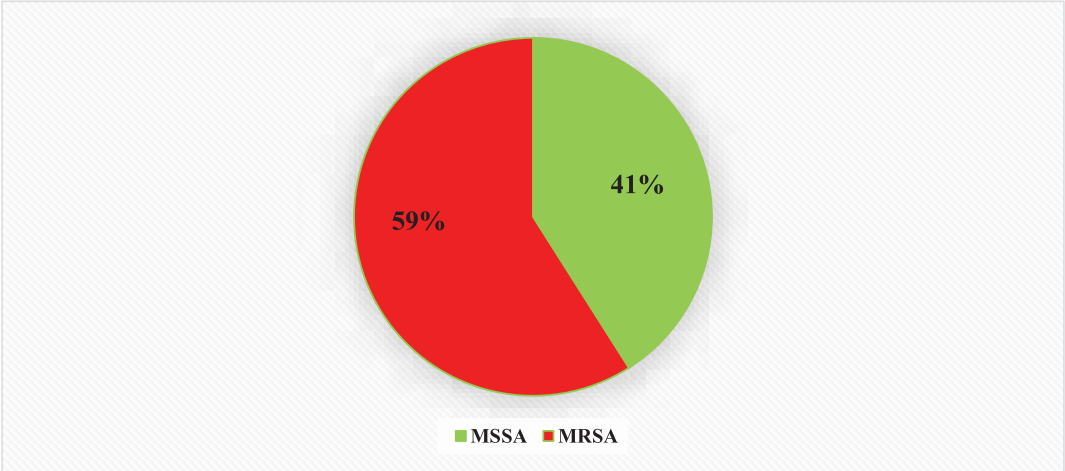


Figure 47: MRSA in blood (n=398)

SDG Target 3.d.2 | Bloodstream infections due to selected antimicrobial-resistant organisms

Indicator name:

Indicator 3.d.2: Proportion of bloodstream infections due to selected antimicrobial-resistant organisms (%)

Table 10: Bloodstream infections due to selected antimicrobial-resistant organisms (MRSA & ESBL *E. coli*)

Year	MRSA (%)	ESBL *E. coli* (%)
2022	60.6	72.8
2023	56.4	73.3
2024	68.7	64.8

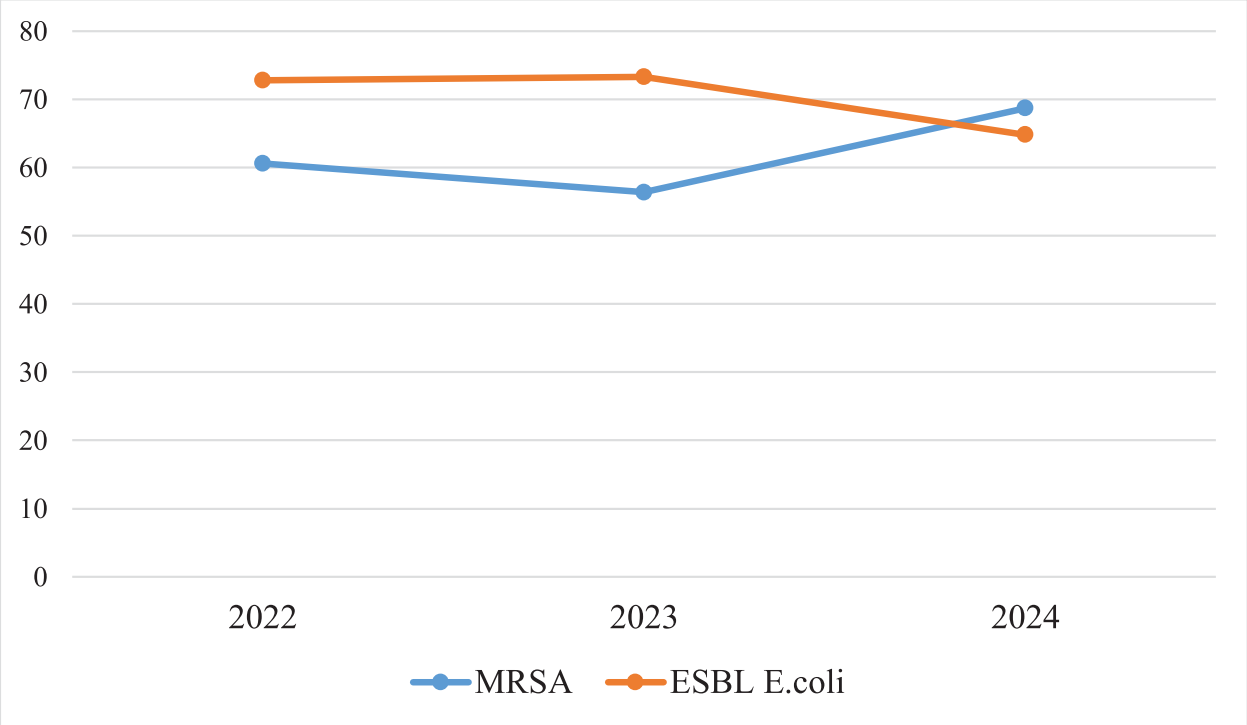


Figure 48: Bloodstream infections due to selected antimicrobial-resistant organisms (MRSA & ESBL *E. coli*)

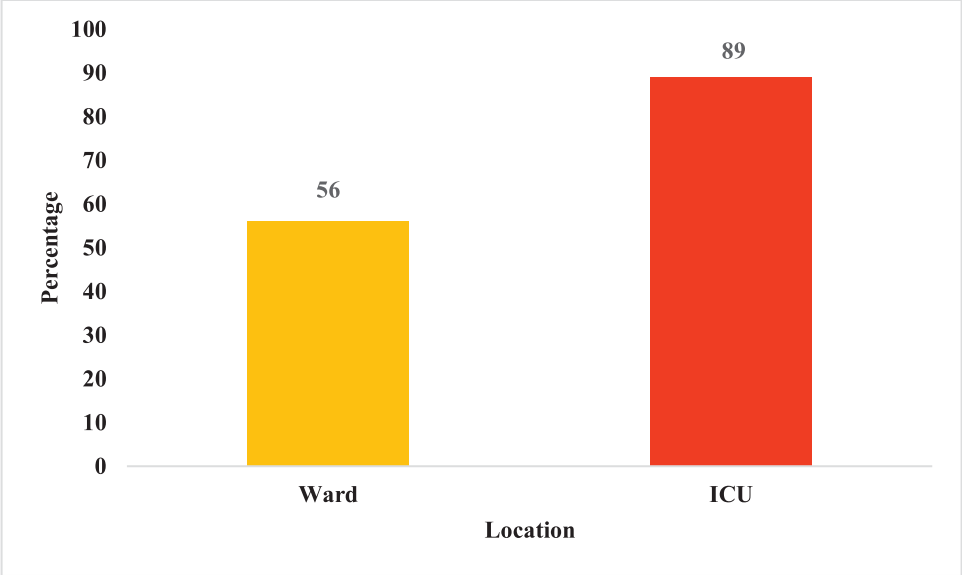


Figure 49: Distribution of MRSA in blood in Ward (n=362) and ICU (n=37)

Table 11: Distribution of bacterial priority pathogen according to WHO

Critical group	High group	Medium group
Carbapenem-resistant Enterobacterales • *E. coli* - 8% • *K. pneumoniae* - 22%	**Fluoroquinolone-resistant *Salmonella* Typhi** - 62%	**Macrolide-resistant Group A Streptococci** • *S. pyogenes* - 89%
3G Cephalosporin-resistant Enterobacterales • *E. coli* - 60% • *K. pneumoniae* - 50%	**Fluoroquinolone-resistant *Shigella* spp.** - 98%	**Macrolide-resistant *S. pneumoniae*** - 89%
Carbapenem-resistant *Acinetobacter* spp.- 63%	**Vancomycin-resistant *E. faecium*** - 29%	**Penicillin-resistant Group B Streptococci** • *S. agalactiae* - 0%
	Carbapenem-resistant *P. aeruginosa* - 34%	
	3G Cephalosporin-resistant *N. gonorrhoeae* - 13% **Fluoroquinolone-resistant *N. gonorrhoeae*** - 63%	
	Methicillin-resistant *S. aureus* - 54%	

Antibiogram

Antibiogram of Gram-Negative and Gram-Positive Bacteria: (All isolates from case-based and laboratory-based surveillance from all locations - Outdoor, Indoor and ICU)																																	
Susceptible %																																	
Organisms	Amikacin	Amoxicillin-Clavulanate	Ampicillin	Azithromycin	Aztreonam	Cefazolin (Urine only)	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Chloramphenicol	Ciprofloxacin	Clindamycin	Colistin*	Doxycycline	Erythromycin	Fosfomycin (Urine only)	Gentamicin	Imipenem	Levofloxacin	Linezolid	Mecillinam	Meropenem	Netilmicin	Nitrofurantoin (Urine only)	Oxacillin	Penicillin	Piperacillin-tazobactam	Spectinomycin	Sulfamethoxazole-Trimethoprim	Tetracycline	Vancomycin
Gram Negative Bacteria																																	
E. coli	88	50	14		50	11	55	27	53	40	30		40					96	81	92				92		78			76		47	52	
K. pneumoniae	76	45			55		61	38	55	50	35		53						74	81				78		38			63		54	58	
Proteus spp.	75	41			53		60	51	52	60			40						60	72				84					81		36		
Enterobacter spp.	76	15			46		55	44	41	56	6		40						64	80				84		30			69			77	
Acinetobacter spp.	39						30		27	22			30		96	51			43	39				37					33		43		
P. aeruginosa	76				47		54		53				54							69				66	72				71				
Shigella spp.			14	33						53			2										92							27		
V. cholerae			18	99								50	33																	20	79	
Salmonella Typhi (from blood sample)			88	58						99			38							99	87			100							91		
N. gonorrhoeae				24				40		87			37															23		100		42	
Gram Positive Bacteria																																	
S. aureus				21									39	47		73			82			91				83	46	15			59		99
Enterococcus spp.			64										33									88				87		43				23	86
S. pneumoniae							90			98	98			68			11			98	53	100		95				57			36	18	100
S. agalactiae										100				58			38				75	100						100				41	100
S. pyogenes							78			96				50			11					96		89				94				44	96

* Intermediate

Antibiogram of Gram-Negative and Gram-Positive Bacteria: Intensive Care Unit (ICU)

Susceptible %

Organisms	Amikacin	Amoxicillin-Clavulanate	Ampicillin	Azithromycin	Aztreonam	Cefazolin (Urine only)	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Clindamycin	Colistin*	Doxycycline	Fosfomycin (Urine only)	Gentamicin	Imipenem	Linezolid	Meropenem	Netilmicin	Nitrofurantoin (Urine only)	Oxacillin	Penicillin	Piperacillin-tazobactam	Sulfamethoxazole-Trimethoprim	Tetracycline	Vancomycin
Gram Negative Bacteria																												
E. coli	25	11	0		7		5	9	9	8	2	5				100	46	56		53		71			20	31	64	
K. pneumoniae	18	4			6		4	0	5	3	1	5					23	26		21		0			9	13	39	
Proteus spp.	0	0			9		8		0	8	0	8					8	13		8					8	17		
Acinetobacter spp.	9						6		6	2		7		97	26		9	7		6					5	15		
P. aeruginosa	0				27		30		22			25						36		33	37				26			
Gram Positive Bacteria																												
S. aureus				11								18	21		72		43		67				12	2		51		96

* Intermediate

Antibiogram of Gram-Negative and Gram-Positive Bacteria from Blood Specimens: Isolates from Case-based and Lab-based Surveillance

Susceptible %

Organisms	Location	Amoxicillin-Clavulanate	Amikacin	Ampicillin	Azithromycin	Aztreonam	Oxacillin	Cefixime	Ceftazidime	Ciprofloxacin	Cefepime	Ceftriaxone	Cefuroxime	Clindamycin	Colistin*	Doxycycline	Gentamicin	Imipenem	Meropenem	Linezolid	Levofloxacin	Penicillin G	Piperacillin-tazobactam	Sulfamethoxazole-Trimethoprim	Tetracycline	Vancomycin	Netilmycin
Gram Negative Bacteria																											
*E. coli***	Overall	42	82	9		37		18	37	32	42	29	21				77	84	84				69	47	56		
K. pneumoniae	Overall	15	36			20		16	19	26	21	18	12				38	40	37				25	34	47		
	ICU	3	18						3	3	3	0	0				11	23	25				11	11			
*P. aeruginosa***	Overall					34			55	68	42							70	69				75				62
Salmonella Typhi**	Overall			88	58					38		99						99	100		87						
Acinetobacter spp.	Overall		38						29	33	29	18			98	53	38	30	38				37	53			
	ICU		21						14	20	17	5				26	18	15	13				13	25			
Gram Positive Bacteria																											
S. aureus	Overall				18		41			51				48		85	79			92		9		57		98	
	ICU				9		12			24				26		86	47			45		3		43			

*Intermediate

**Due to insufficient number of isolates in ICU, data is excluded.

Antibiogram of Gram-Negative and Gram-Positive Bacteria from Urine Specimens from all locations (Outdoor, Indoor and ICU): from Case-based and Lab-based Surveillance

Organisms	Susceptible %																						
	Amoxicillin-Clavulanate	Amikacin	Ampicillin	Aztreonam	Oxacillin	Cefixime	Ceftazidime	Ciprofloxacin	Cefepime	Ceftriaxone	Cefuroxime	Doxycycline	Gentamicin	Imipenem	Meropenem	Linezolid	Piperacillin-tazobactam	Sulfamethoxazole-Trimethoprim	Tetracycline	Fosfomycin	Nitrofurantoin	Cefazolin	Netilmycin	Vancomycin
Gram Negative Bacteria																							
E. coli	53	89	16	53		28	55	41	57	42	32		82	93	93		78	48	53	96	78	11		
K. pneumoniae	52	85		63		40	63	59	70	57	42		80	89	87		73	57	56	88	38			
P. aeruginosa		76		45			52	55	57					72	69		77						82	
Gram Positive Bacteria																							
S. aureus					39			37				64	83			90		53			83			100

Sitewise AMR Report

Dhaka Medical College and Hospital

1. Data volume

Number of isolates	2023	2024
445	212	233

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 72.8%, Female - 27.2%
- Median age group: Male = 45-54, Female = 35-44

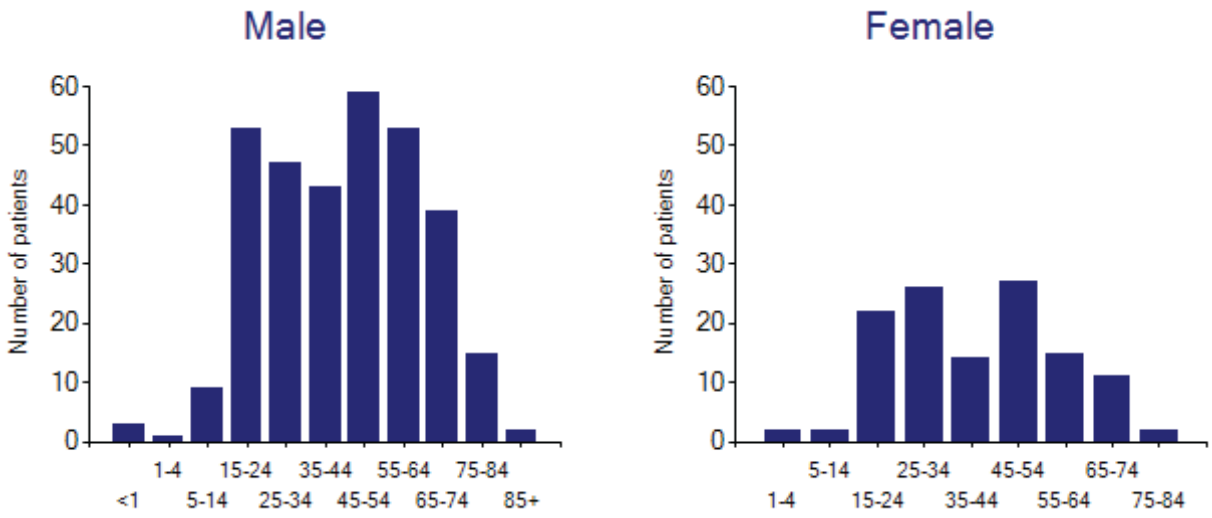


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	156	35
OPD	31	7
ICU	258	58

Table 2: Distribution of isolates by location.

2.3 Sample details

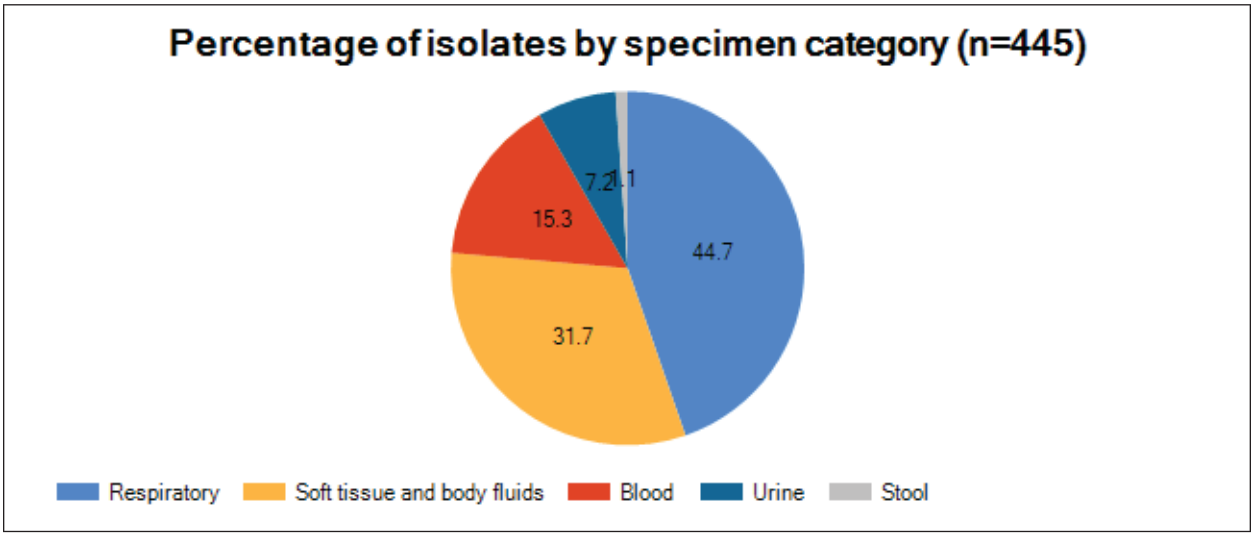


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	19	4.3
Aerobic Gram-negative bacteria	426	95.7

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Acinetobacter spp.	145	32.6
Pseudomonas aeruginosa	119	26.7
Escherichia coli	67	15.1
Klebsiella pneumoniae	64	14.4
Staphylococcus aureus	19	4.3
Enterobacter spp.	18	4
Proteus spp.	4	0.9
Vibrio cholerae	3	0.7
Citrobacter spp.	2	0.4
Salmonella spp.	1	0.2

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

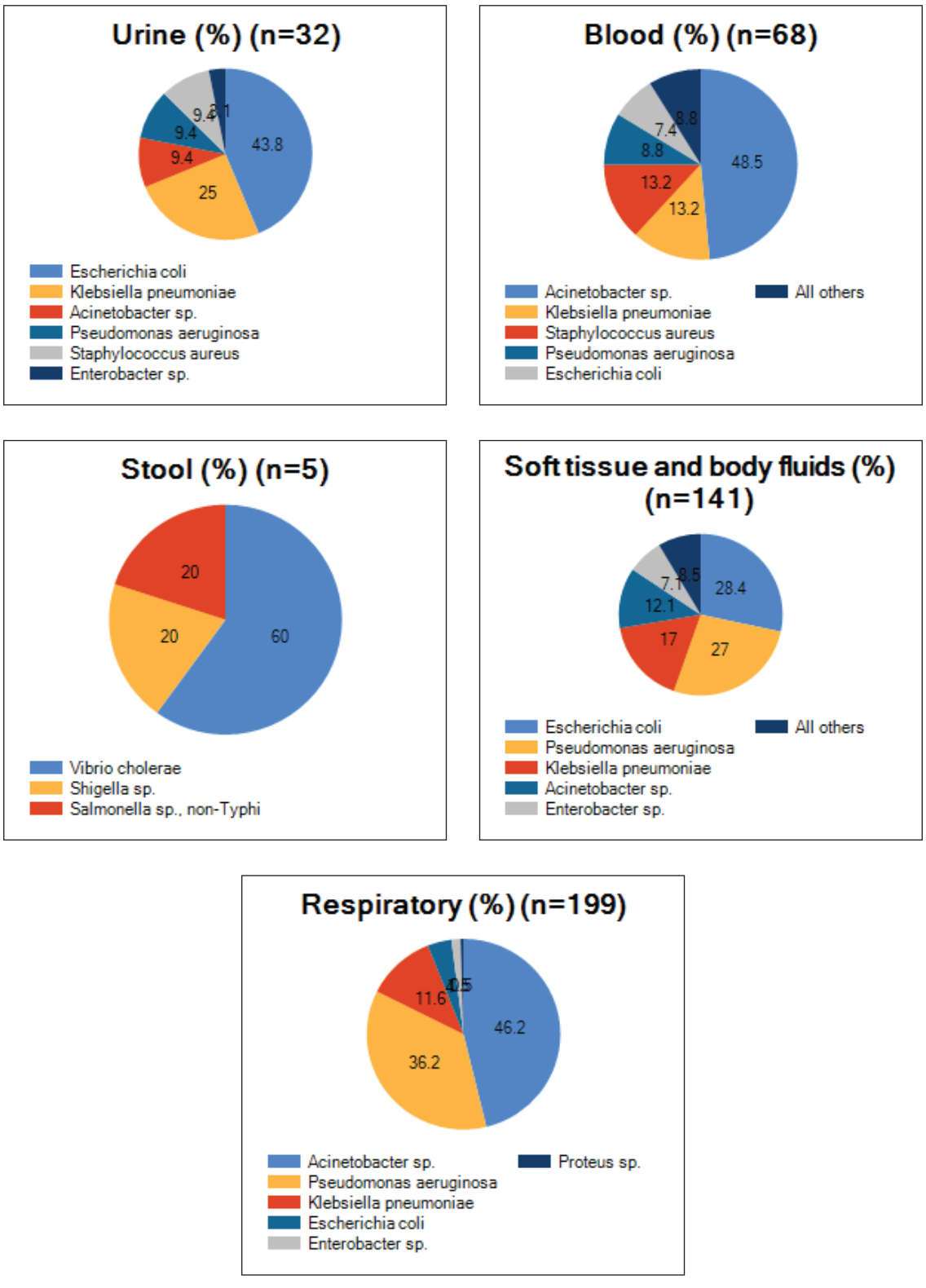


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	19	13 (68%)
Acinetobacter spp.	145	140 (97%)
E. coli	67	64 (96%)
K. pneumoniae	64	63 (98%)
P. aeruginosa	119	108 (91%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	71/81 (88%)
	Pseudomonas aeruginosa	Carbapenem resistance	49/58 (84%)
	Escherichia coli	Cefotaxime-resistant	-
	Escherichia coli	Ceftriaxone-resistant	61/66 (92%)
	Escherichia coli	Meropenem-resistant	17/36 (47%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	13/19 (68%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	3/3 (100%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	1/1 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of DMCH

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Gentamicin	Meropenem	Netilmicin	Piperacillin/Tazobactam	Ceftazidime/Avibactam
Acinetobacter spp.	144	5			3	3	0		3	13	7	12		4	
P. aeruginosa	119			21	15	9			5			16	30	8	18
E. coli	67	30	0	10	10	12	8	0	8		48	53		18	
K. pneumoniae	64	12		5	7	3	3	0	3		19	30		12	

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

Mymensingh Medical College Hospital

1. Data volume

Number of isolates	2023	2024
367	190	177

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 52.9%, Female - 47.1%
- Median age group: Male = 45-54, Female = 35-44

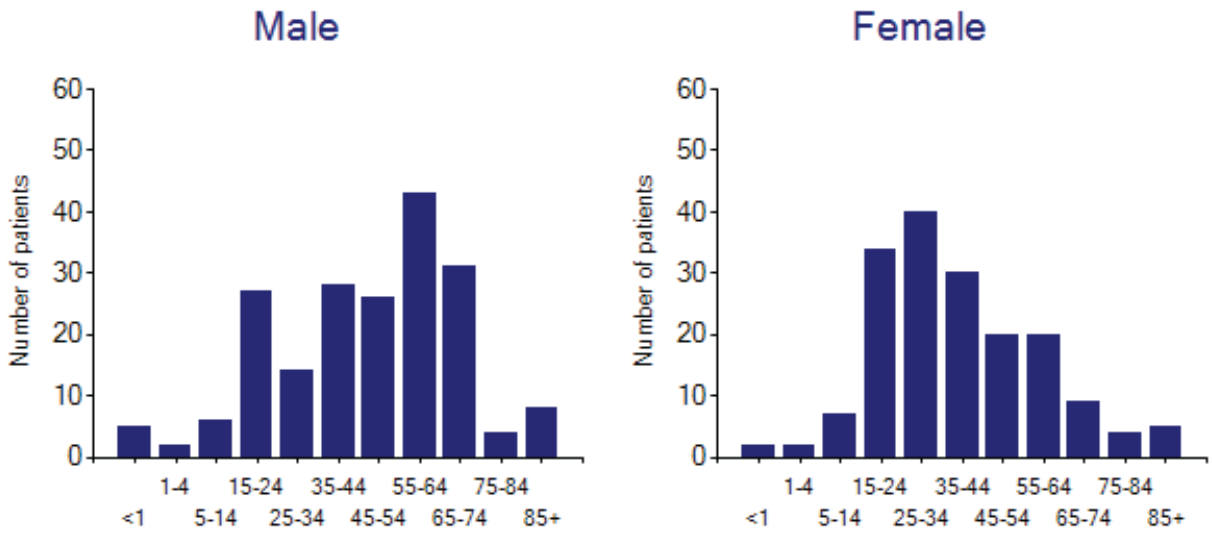


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	196	53.4
OPD	38	10.4
ICU	133	36.2

Table 2: Distribution of isolates by location.

2.3 Sample details

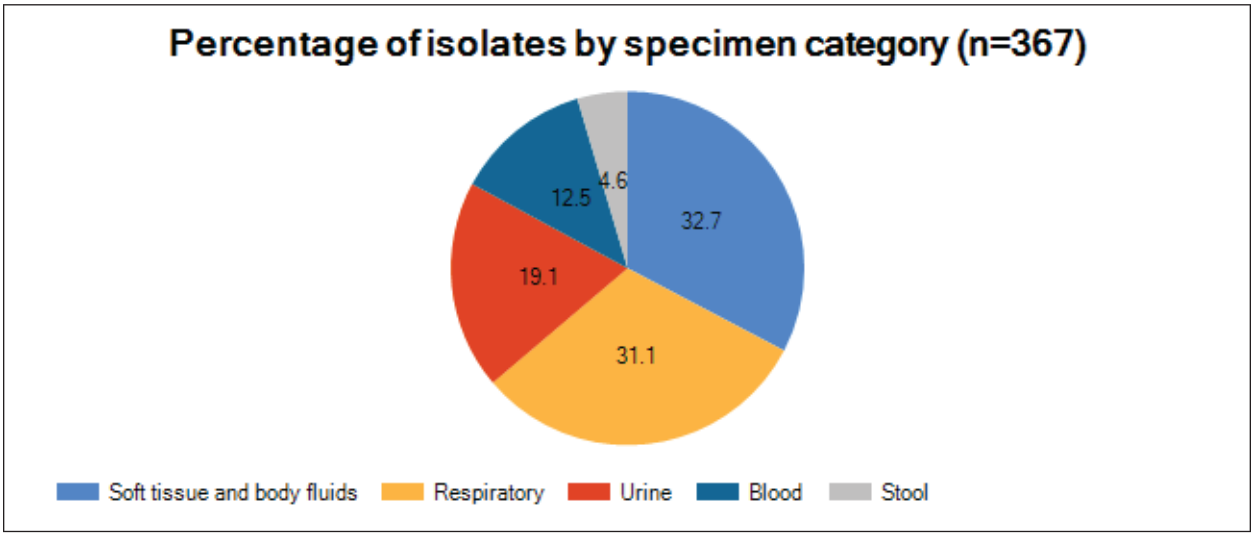


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	9	2.5
Aerobic Gram-negative bacteria	358	97.5

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Klebsiella pneumoniae	84	22.9
Acinetobacter spp.	80	21.8
Escherichia coli	75	20.4
Pseudomonas aeruginosa	56	15.3
Proteus spp.	29	7.9
Enterobacter spp.	10	2.7
Salmonella spp.	9	2.5
Staphylococcus aureus	8	2.2
Vibrio cholerae	6	1.6
Other	5	1.4

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

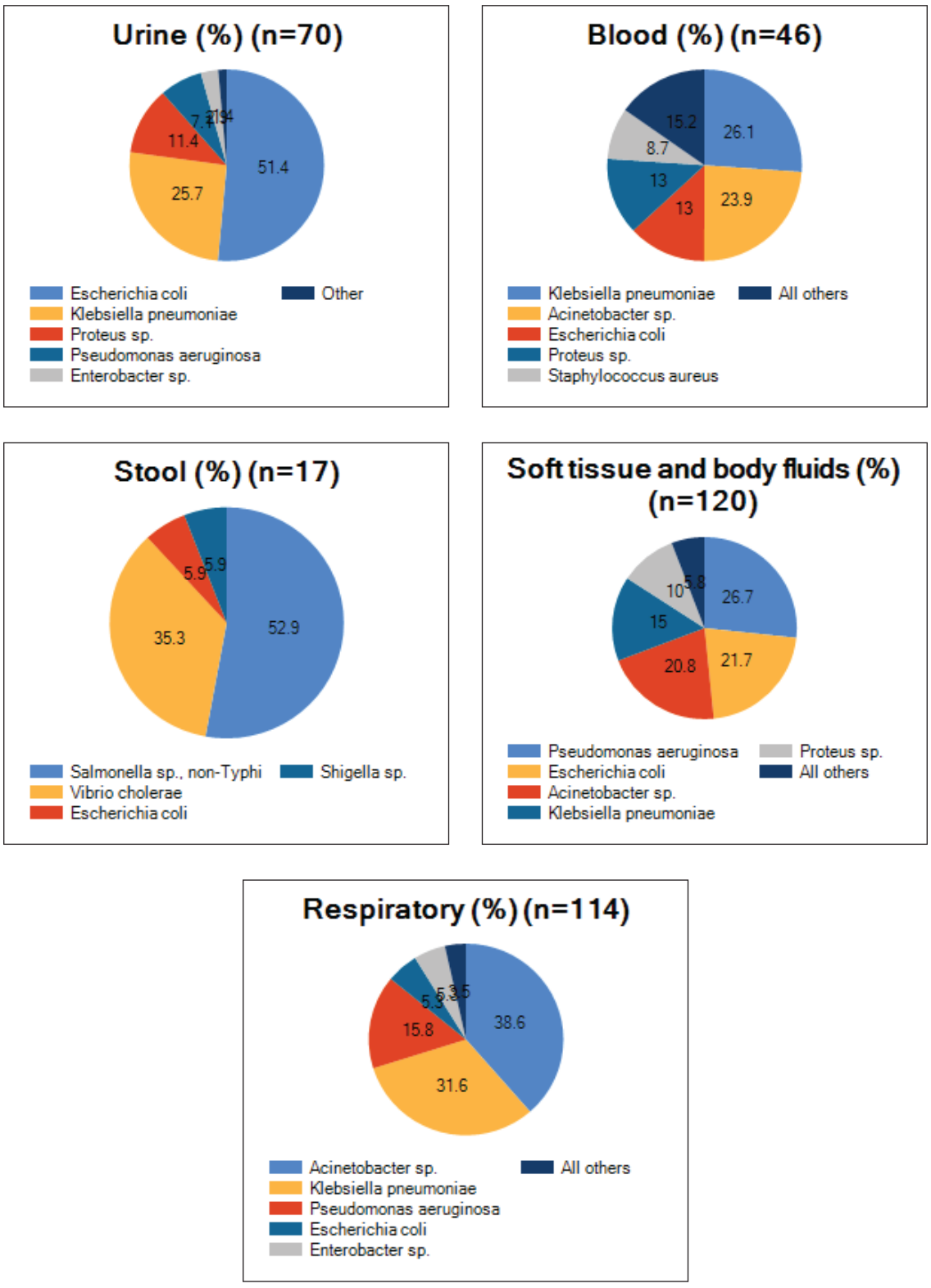


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	8	7 (88%)
Acinetobacter sp.	80	75 (94%)
E. coli	75	64 (85%)
K. pneumoniae	84	79 (94%)
P. aeruginosa	56	46 (82%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	Acinetobacter spp.	Carbapenem resistance	74/78 (95%)
	Pseudomonas aeruginosa	Carbapenem resistance	44/53 (83%)
	Escherichia coli	Cefotaxime-resistant	7/10 (70%)
	Escherichia coli	Ceftriaxone-resistant	56/73 (77%)
	Escherichia coli	Meropenem-resistant	31/72 (43%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	5/6 (83%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Helicobacter pylori	Clarithromycin-resistant	-
	Campylobacter spp.	Fluoroquinolone-resistant	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	9/12 (75%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	1/1 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of MMCH

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Gentamicin	Meropenem	Netilmicin	Nitrofurantoin	Piperacillin/Tazobactam
K. pneumoniae	84	29	1	16	10		10	10	3	8		42	34			18
Acinetobacter spp.	79	9			5		5	1		2	38	14	5			9
E. coli	74	59	1	17	22	26	14	23	9	19		71	57		79	44
P. aeruginosa	56			21	29		11			40			17	40		18
Proteus sp.	29	34		23	18		7	18		34		36	45			28

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

Rajshahi Medical College Hospital

1. Data volume

Number of isolates	2023	2024
474	145	327

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 61.8%, Female - 38.2%
- Median age group: Male = 45-54, Female = 35-44

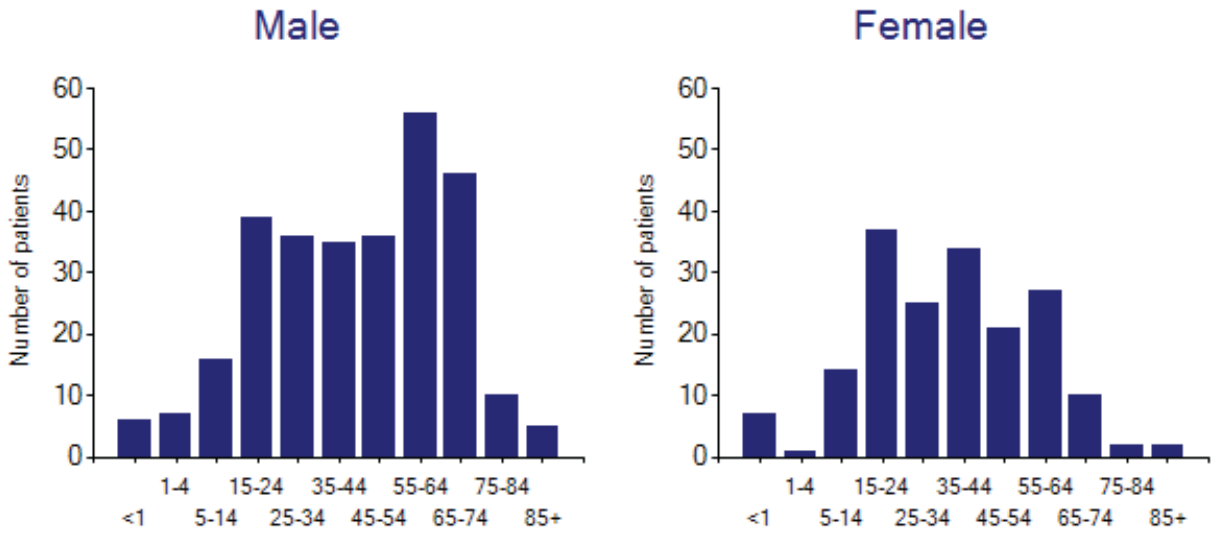


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	173	36.5
OPD	109	23
ICU	192	40.5

Table 2: Distribution of isolates by location.

2.3 Sample details

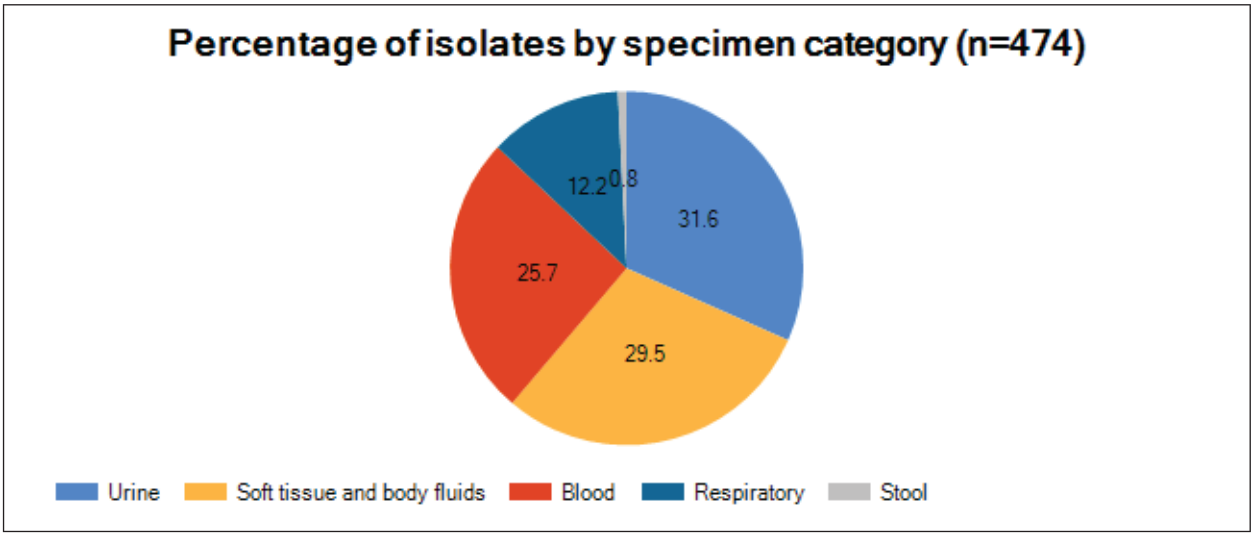


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	85	17.9
Aerobic Gram-negative bacteria	365	77
Fungi	5	1.1
Other results	19	4

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	126	26.6
Klebsiella pneumoniae	87	18.4
Pseudomonas aeruginosa	82	17.3
Staphylococcus aureus	50	10.5
Acinetobacter spp.	46	9.7
Other	19	4
Proteus spp.	10	2.1
Salmonella spp.	7	1.5
Enterococcus spp.	6	1.3

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

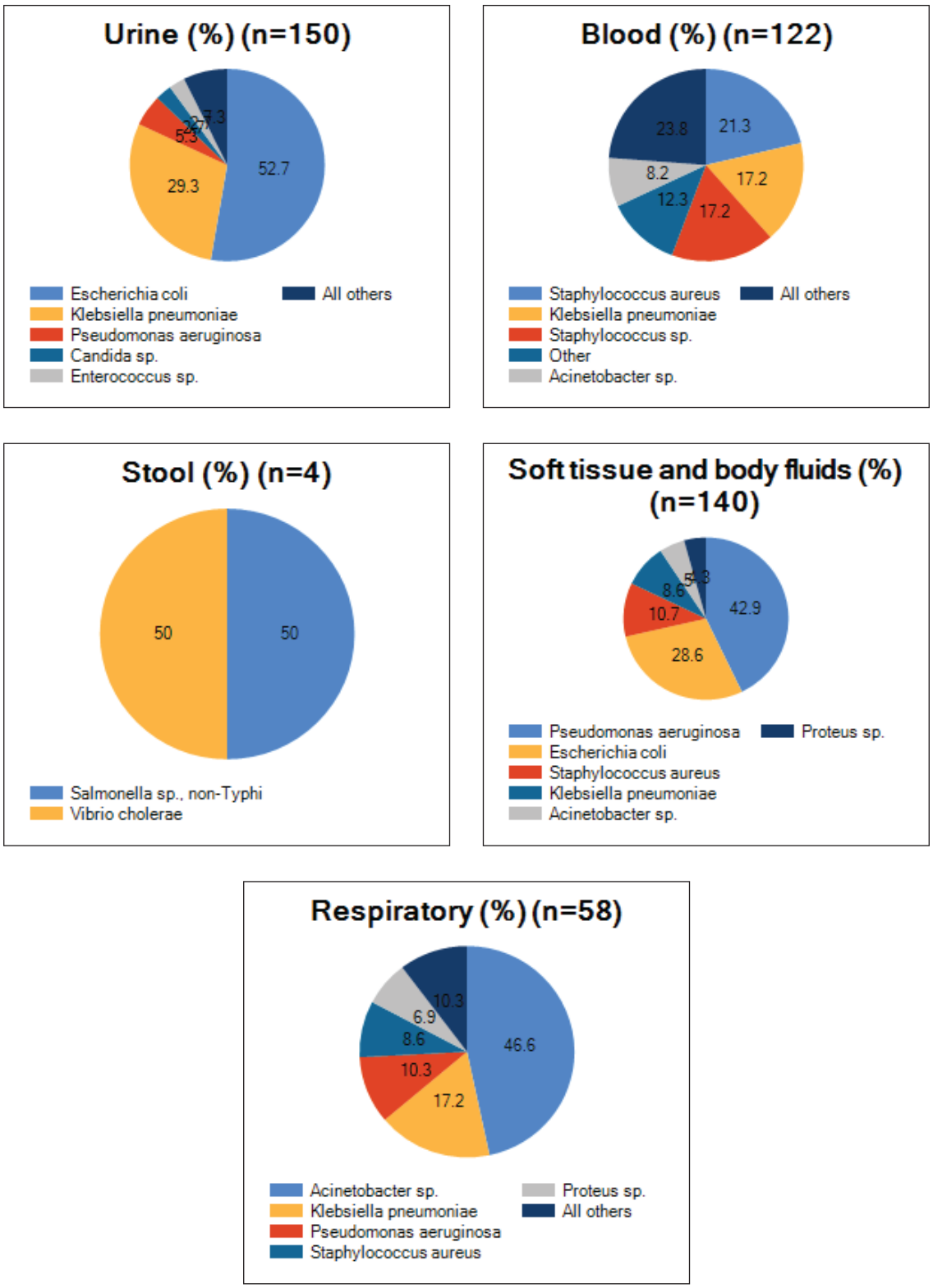


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	50	34 (68%)
Acinetobacter spp.	46	45 (98%)
E. coli	126	111 (88%)
K. pneumoniae	87	76 (87%)
P. aeruginosa	82	59 (72%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	42/43 (98%)
	P. aeruginosa	Carbapenem resistance	44/81 (54%)
	E. coli	Cefotaxime-resistant	69/89 (78%)
	E. coli	Ceftriaxone-resistant	103/126 (82%)
	E. coli	Meropenem-resistant	45/125 (36%)
High	*E. faecium*	Vancomycin-resistant	0/1 (0%)
	S. aureus	Methicillin-resistant (MRSA)	13/24 (54%)
	S. aureus	Vancomycin-resistant	1/24 (4%)
	S. aureus	Vancomycin-intermediate	0/24 (0%)
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	9/9 (100%)
	N. gonorrhoeae	Third generation cephalosporin-resistant	-
	N. gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*S. pneumoniae*	Penicillin non-susceptible	-
	H. influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	0/1 (0%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of RMCH

Organism	Number of patients	Cefoxitin	Ciprofloxacin	Clindamycin	Doxycycline	Erythromycin	Gentamicin	Linezolid	Rifampin	Vancomycin	Levofloxacin
S. aureus	49	46	16	33	68		61	45	81	96	9

Table 7: Gram-positive antibiogram. %Susceptible, first isolate per patient

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Fosfomycin	Gentamicin	Meropenem	Netilmycin	Nitrofurantoin	Piperacillin-	Cefotaxime	ceftazidime-
E. coli	126	64	5	28	18	16	18	3	20		92	60	64		82	31	22	77
K. pneumoniae	87	46		27	21	30	22	6	17		74	43	38		33	21		52
P. aeruginosa	82			32	17	14			38				46	44		33		64
Acinetobacter spp.	46	4			2	3	2		0	17		6	2			0		

Table 8: Gram-negative antibiogram. %Susceptible, first isolate per patient

Rangpur Medical College and Hospital

1. Data volume

Number of isolates	2023	2024
370	164	206

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 55.4%, Female - 44.6%
- Median age group: Male = 35-44, Female = 25-34

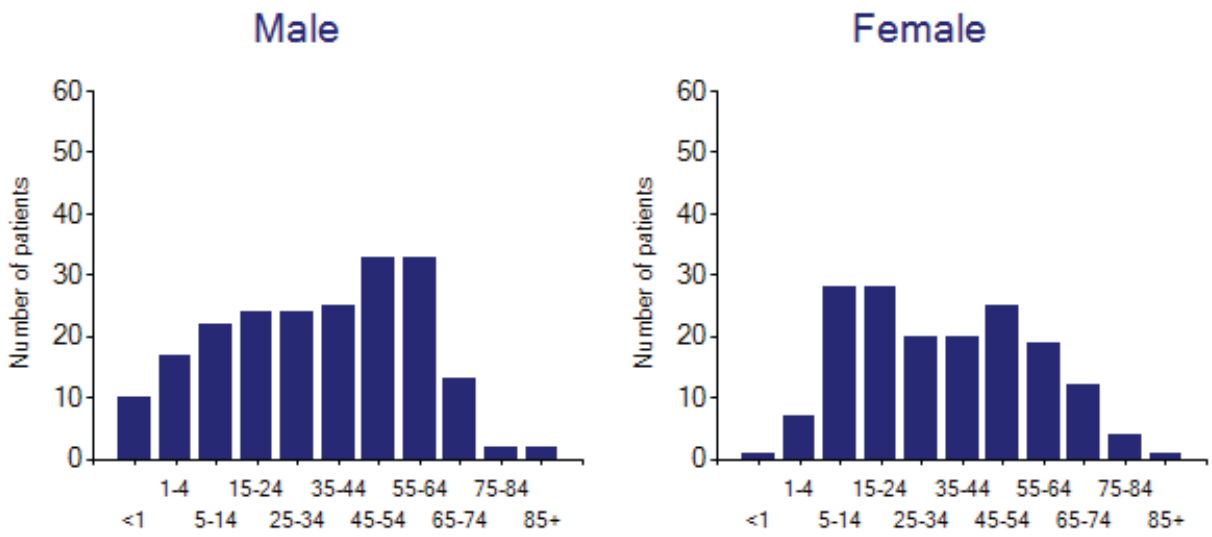


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	219	59.2
OPD	99	26.8
ICU	52	14

Table 2: Distribution of isolates by location.

2.3 Sample details

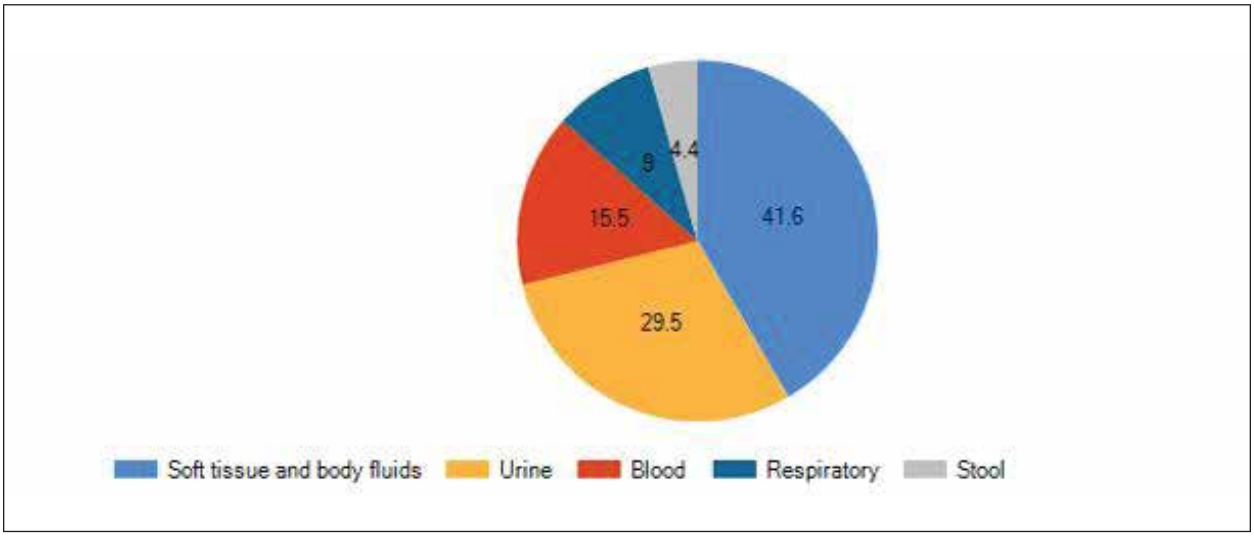


Figure 2: The figure shows the percentage of isolates stratified by specimen category (n=370)

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	41	11.1
Aerobic Gram-negative bacteria	311	84.1
Fungi	18	4.8

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Pseudomonas aeruginosa	114	30.8
Klebsiella pneumoniae	106	28.6
Escherichia coli	69	18.6
Staphylococcus aureus	24	6.5
Candida sp.	18	4.9
Enterococcus sp.	15	4.1
Acinetobacter sp.	13	3.5
Salmonella sp.	4	1.1
Other	3	0.8
Proteus sp.	3	0.8

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

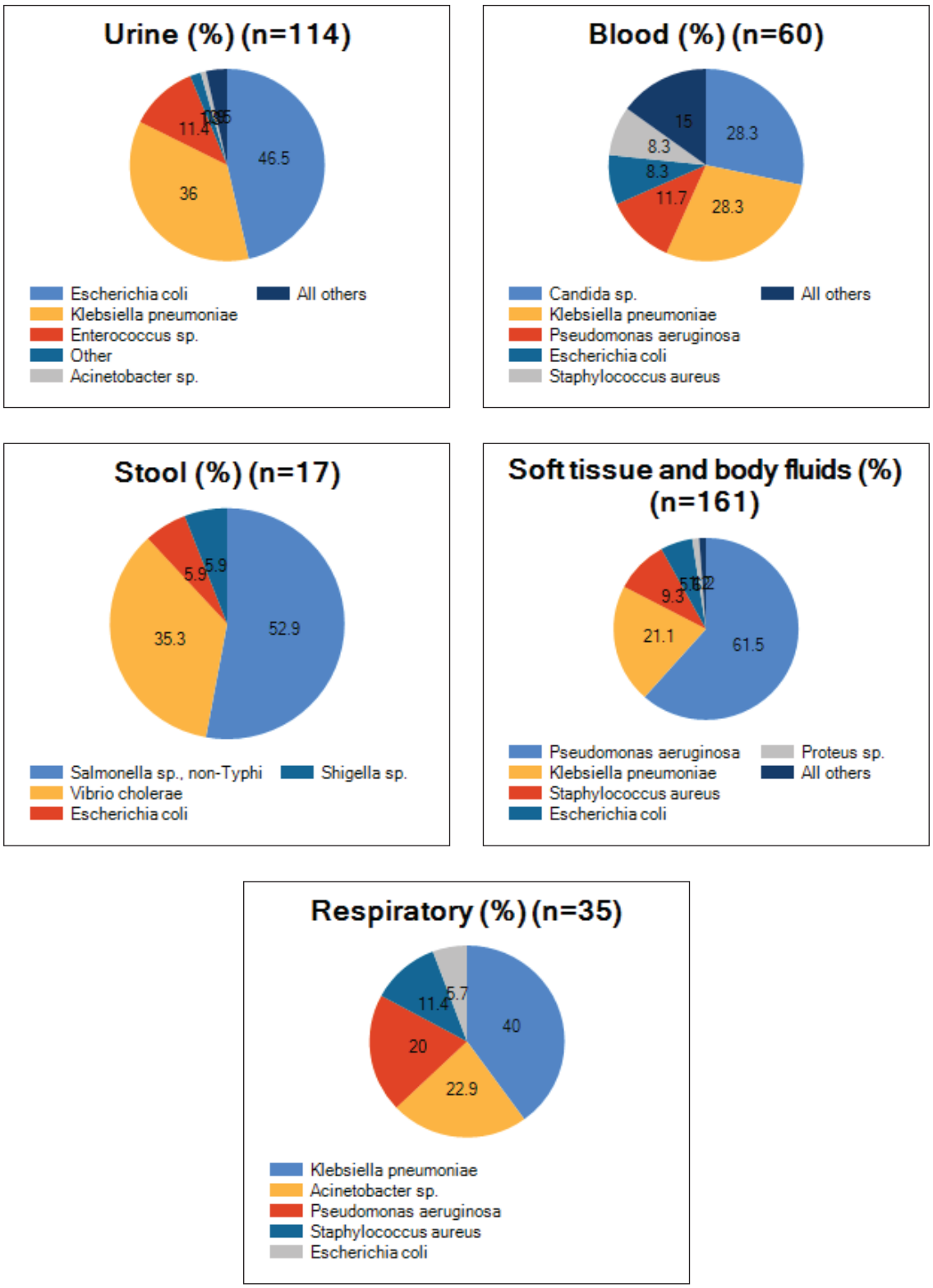


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
Staphylococcus aureus	24	18 (75%)
Acinetobacter spp.	13	10 (77%)
Escherichia coli	69	53 (77%)
Klebsiella pneumoniae	106	82 (77%)
Pseudomonas aeruginosa	114	101 (89%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	9/10 (90%)
	Pseudomonas aeruginosa	Carbapenem resistance	81/103 (79%)
	Escherichia coli	Cefotaxime-resistant	30/42 (71%)
	Escherichia coli	Ceftriaxone-resistant	35/43 (81%)
	Escherichia coli	Meropenem-resistant	19/65 (29%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	16/22 (73%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	3/4 (75%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	1/1 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of RpMCH

Organism	Number of patients	Cefoxitin	Ciprofloxacin	Clindamycin	Doxycycline	Gentamicin	Linezolid
Staphylococcus aureus	24	27	26	29	52	43	60

Table 7: Gram-positive antibiogram. %Susceptible, first isolate per patient

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Fosfomycin	Gentamicin	Meropenem	Netilmicin	Nitrofurantoin	Ofloxacin	Piperacillin	Piperacillin/ Tazobactam	Cefotaxime
P. aeruginosa	113			10	12	6			14			21	19		11	16	31	
K. pneumoniae	106	42		10	19	15	10	20	29	68	43	51		22			21	
E. coli	69	65	3	14	20	28	19	16	34	94	66	71		63			36	29

Table 8: Gram-negative antibiogram. %Susceptible, first isolate per patient

Chittagong Medical College Hospital

1. Data volume

Number of isolates	2023	2024
440	211	229

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 69.3%, Female - 30.7%
- Median age group: Male = 45-54, Female = 35-44

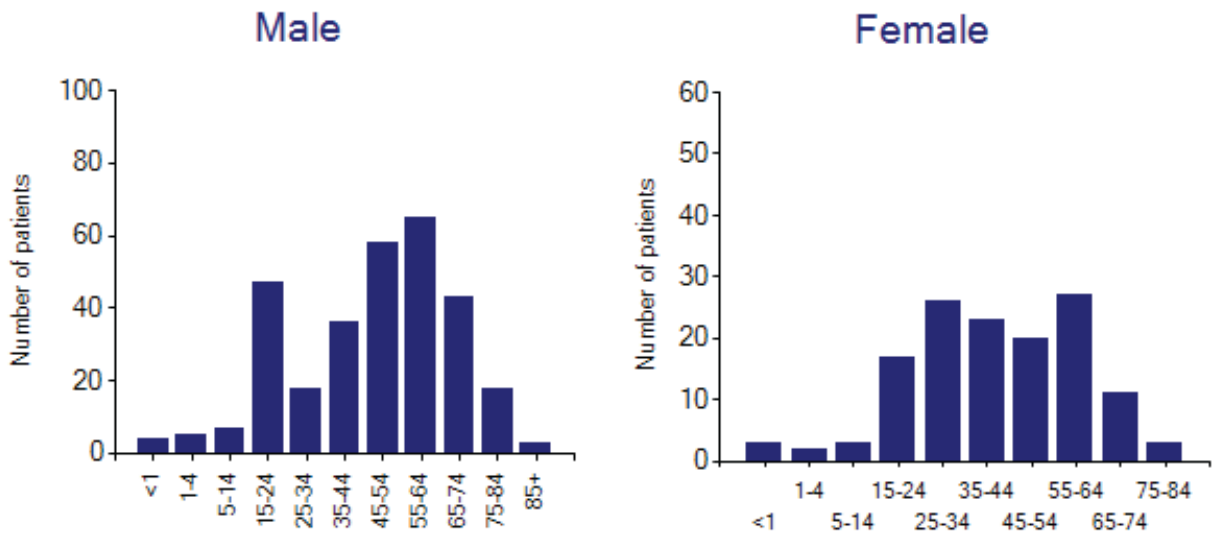


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	210	47.7
OPD	36	8.2
ICU	194	44.1

Table 2: Distribution of isolates by location.

2.3 Sample details

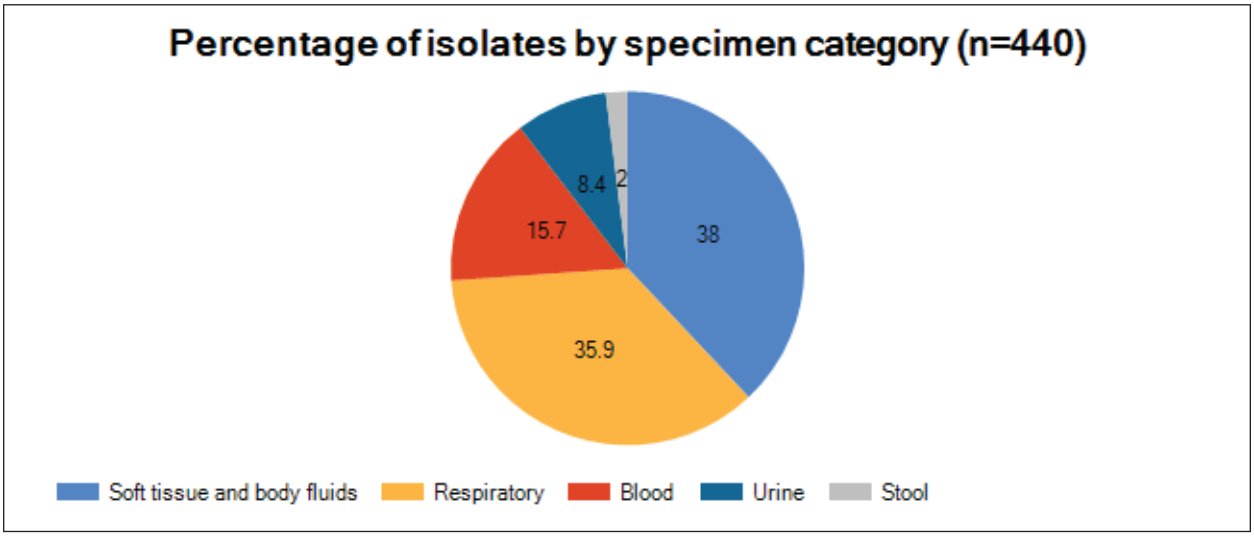


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	9	2
Aerobic Gram-negative bacteria	431	98

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Acinetobacter spp.	146	33.2
Pseudomonas aeruginosa	132	30
Klebsiella pneumoniae	81	18.4
Escherichia coli	52	11.8
Proteus spp.	9	2
Staphylococcus aureus	9	2
Shigella spp.	5	1.1
Salmonella spp.	3	0.7
Vibrio cholerae	3	0.7

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

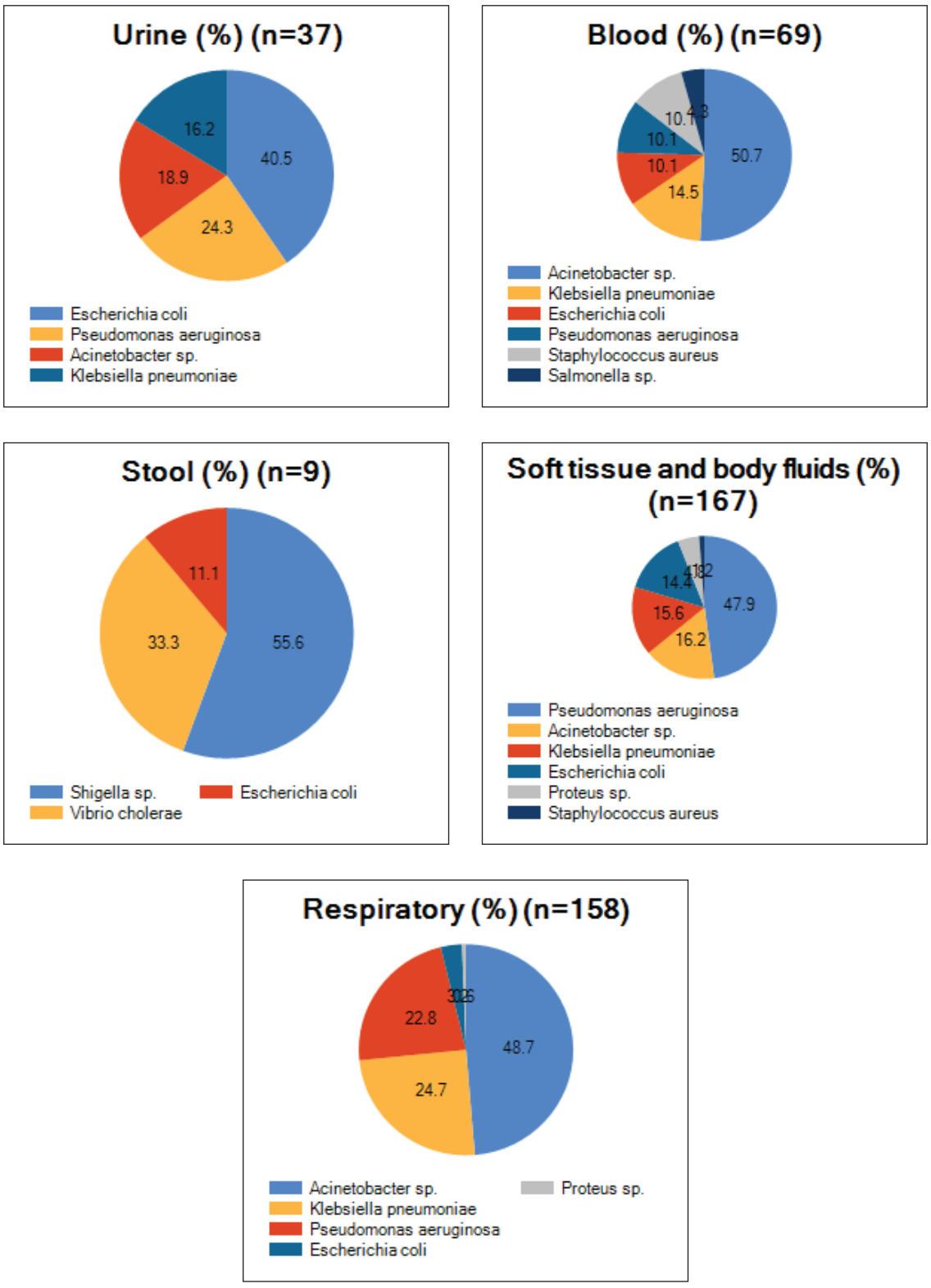


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
Staphylococcus aureus	9	6 (67%)
Acinetobacter spp.	146	125 (86%)
Escherichia coli	52	40 (77%)
Klebsiella pneumoniae	81	75 (93%)
Pseudomonas aeruginosa	132	53 (40%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	103/131 (79%)
	Pseudomonas aeruginosa	Carbapenem resistance	36/113 (32%)
	Escherichia coli	Cefotaxime-resistant	-
	Escherichia coli	Ceftriaxone-resistant	37/44 (84%)
	Escherichia coli	Meropenem-resistant	15/46 (33%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	5/7 (71%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	3/3 (100%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	5/5 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of CMCH

Organism	Number of patients	Amikacin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Gentamicin	Meropenem	Netilmicin	Piperacillin/ Tazobactam	Ceftazidime/Avibactam
Acinetobacter spp.	145	24		19	19	13		23	54	20	21		22	
P. aeruginosa	131		56	57	52			52			68	71	61	88
K. pneumoniae	81	16	15	10	9	8	4	3		24	22		9	
E. coli	51	31	20	28	31	16	7	16		32	67		36	

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

Sher-E-Bangla Medical College Hospital

1. Data volume

Number of isolates	2023	2024
189	70	119

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 37%, Female - 63%
- Median age group: Male = 45-54, Female = 35-44

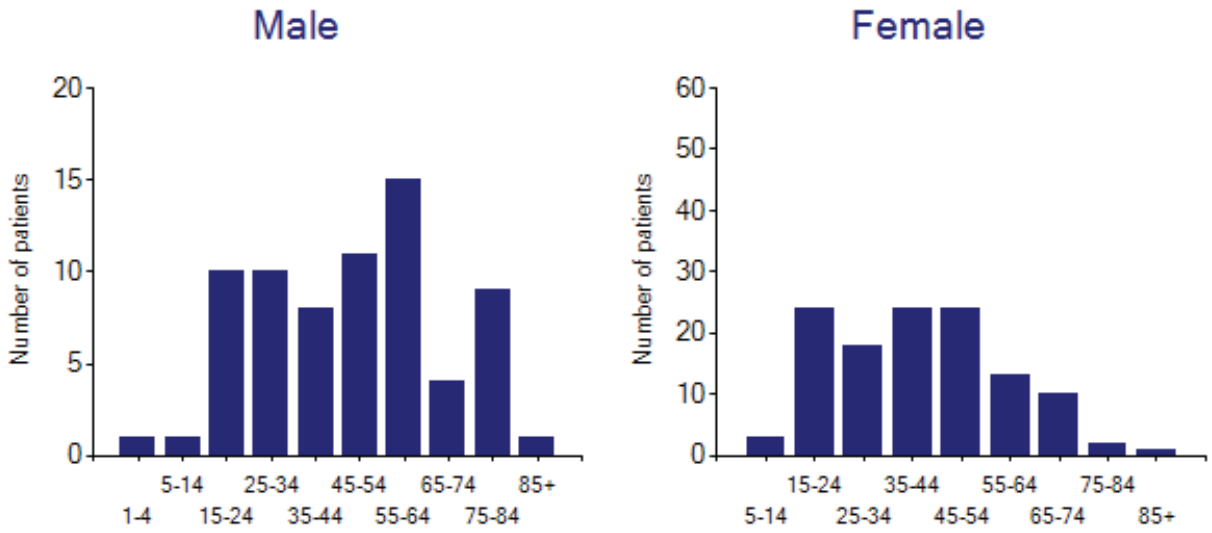


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	90	47.6
OPD	75	39.7
ICU	24	12.7

Table 2: Distribution of isolates by location.

2.3 Sample details

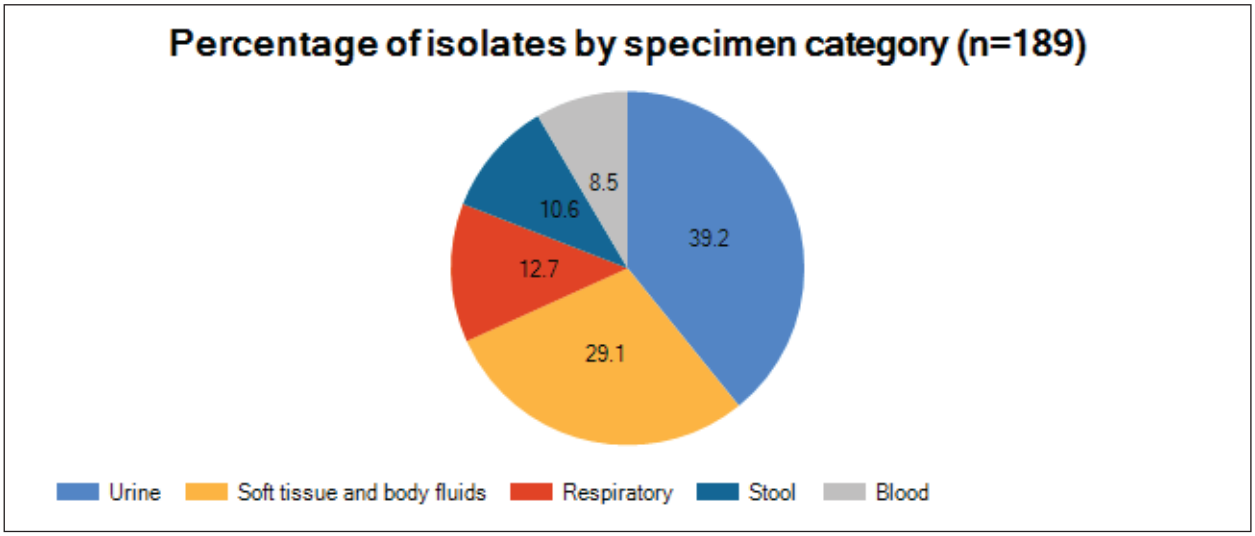


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	10	5.3
Aerobic Gram-negative bacteria	177	93.7
Fungi	2	1

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	49	25.9
Acinetobacter spp.	34	18
Pseudomonas aeruginosa	33	17.5
Klebsiella pneumoniae	25	13.2
Vibrio cholerae	17	9
Salmonella spp.	10	5.3
Staphylococcus aureus	10	5.3
Enterobacter spp.	6	3.2
Candida spp.	2	1.1
Salmonella spp.	2	1.1

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

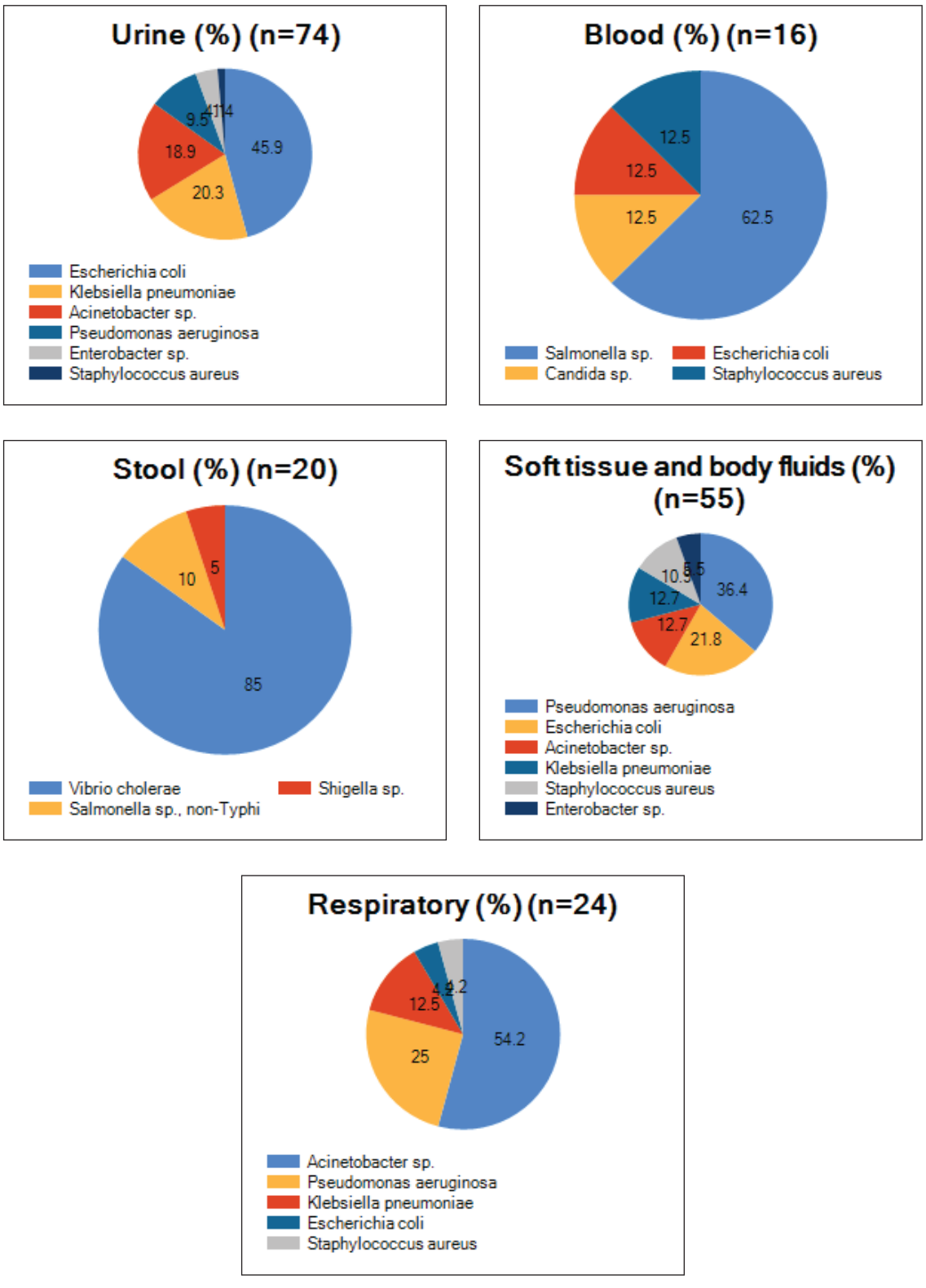


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	10	8 (80%)
Acinetobacter spp.	34	25 (74%)
E. coli	49	34 (69%)
K. pneumoniae	25	18 (72%)
P. aeruginosa	33	16 (48%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	17/28 (61%)
	P. aeruginosa	Carbapenem resistance	12/31 (39%)
	Escherichia coli	Cefotaxime-resistant	5/7 (71%)
	Escherichia coli	Ceftriaxone-resistant	28/45 (62%)
	Escherichia coli	Meropenem-resistant	6/42 (14%)
High	*E. faecium*	Vancomycin-resistant	0/1 (0%)
	S. aureus	Methicillin-resistant (MRSA)	8/8 (100%)
	S. aureus	Vancomycin-resistant	-
	S. aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	10/11 (91%)
	N. gonorrhoeae	Third generation cephalosporin-resistant	-
	N. gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*S. pneumoniae*	Penicillin non-susceptible	-
	H. influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	0/1 (0%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of Antibiogram of SBMCH

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Gentamicin	Meropenem	Netilmicin	Nitrofurantoin	Piperacillin/Tazobactam
E. coli	49	77	0	18	39	5	29	38	2	38		85	86		71	56
Acinetobacter spp.	34	38			28		12	17		15	48	47	39			27
P. aeruginosa	33			38	28		39			52			61	67		52
K. pneumoniae	25	68		22			22	35		30		78	73			41

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

Sylhet MAG Osmani Medical College Hospital

1. Data volume

Number of isolates	2023	2024
164	64	100

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 72.6%, Female - 27.4%
- Median age group: Male = 35-44, Female = 35-44

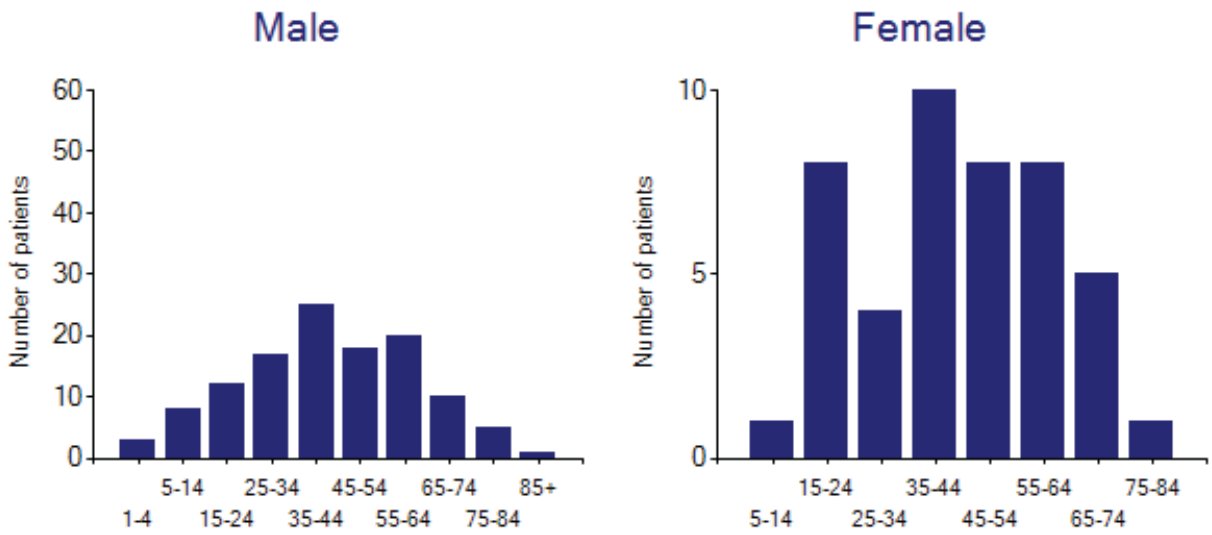


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	96	58.5
OPD	37	22.6
ICU	31	18.9

Table 2: Distribution of isolates by location.

2.3 Sample details

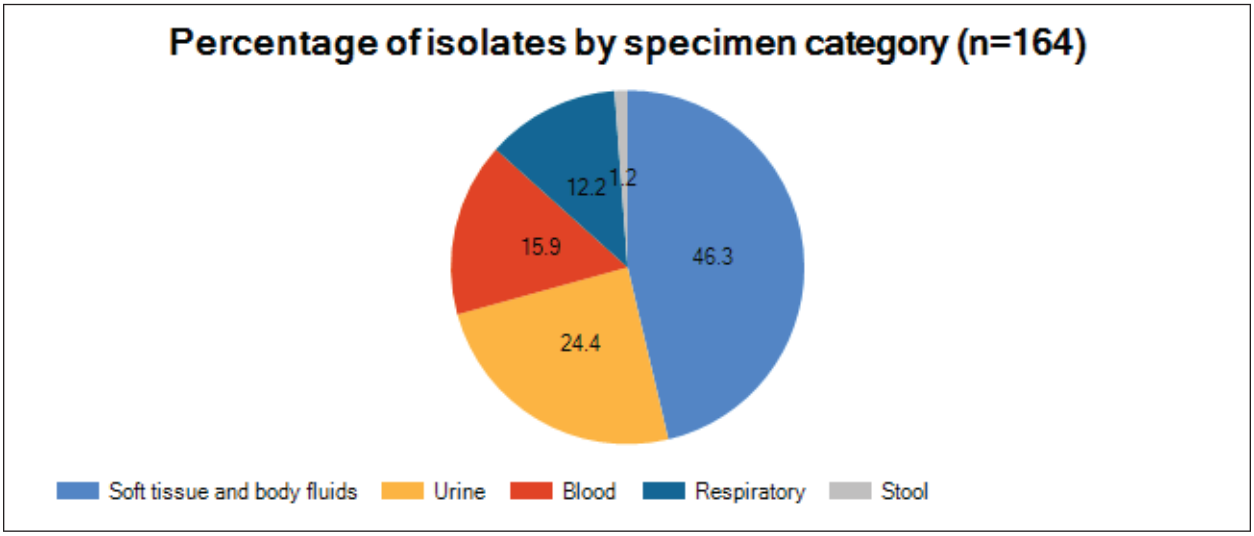


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	26	15.9
Aerobic Gram-negative bacteria	138	84.1

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	49	29.9
Pseudomonas aeruginosa	33	20.1
Klebsiella pneumoniae	27	16.5
Staphylococcus aureus	26	15.9
Acinetobacter spp.	7	4.3
Proteus spp.	7	4.3
Enterobacter spp.	5	3
Citrobacter spp.	3	1.8
Serratia spp.	2	1.2
Salmonella typhi	2	1.2
Salmonella spp.	2	1.2
Aeromonas spp.	1	0.6

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

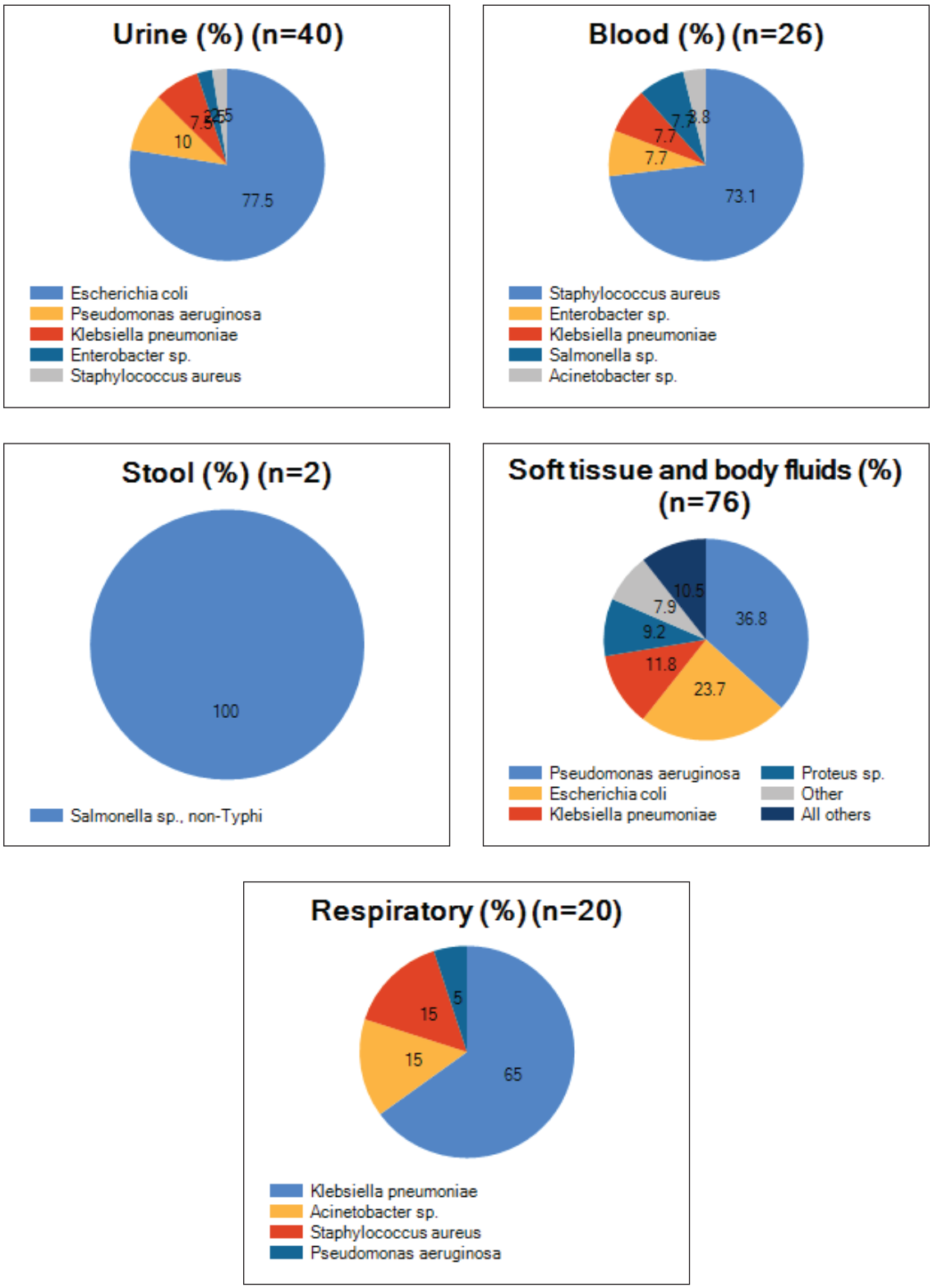


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
Staphylococcus aureus	26	23 (88%)
Acinetobacter sp.	7	6 (86%)
Escherichia coli	49	43 (88%)
Klebsiella pneumoniae	27	27 (100%)
Pseudomonas aeruginosa	33	25 (76%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	4/4 (100%)
	P. aeruginosa	Carbapenem resistance	10/14 (71%)
	E. coli	Cefotaxime-resistant	-
	E. coli	Ceftriaxone-resistant	39/48 (81%)
	E. coli	Meropenem-resistant	6/19 (32%)
High	*E. faecium*	Vancomycin-resistant	0/1 (0%)
	S. aureus	Methicillin-resistant (MRSA)	12/13 (92%)
	S. aureus	Vancomycin-resistant	-
	S. aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	3/3 (100%)
	N. gonorrhoeae	Third generation cephalosporin-resistant	-
	N. gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*S. pneumoniae*	Penicillin non-susceptible	-
	H. influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	0/1 (0%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of SOMCH

Organism	Number of patients	Ciprofloxacin	Clindamycin	Doxycycline	Gentamicin	Linezolid
S. aureus	26	35	48	85	65	65

Table 7: Gram-positive antibiogram. %Susceptible, first isolate per patient

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Gentamicin	Meropenem	Nitrofurantoin	Piperacillin/ Tazobactam
Escherichia coli	49	69	2	12	12	19	19	4	33	65		30	41
P. aeruginosa	33			47	15	39			48				46
K. pneumoniae	27	37		11	15	18	7	4	22	35	50		19

Table 8: Gram-negative antibiogram. %Susceptible, first isolate per patient

Khulna Medical College Hospital

1. Data volume

Number of isolates	2023	2024
331	192	139

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 44.4%, Female - 55.6%
- Median age group: Male = 45-54, Female = 35-44

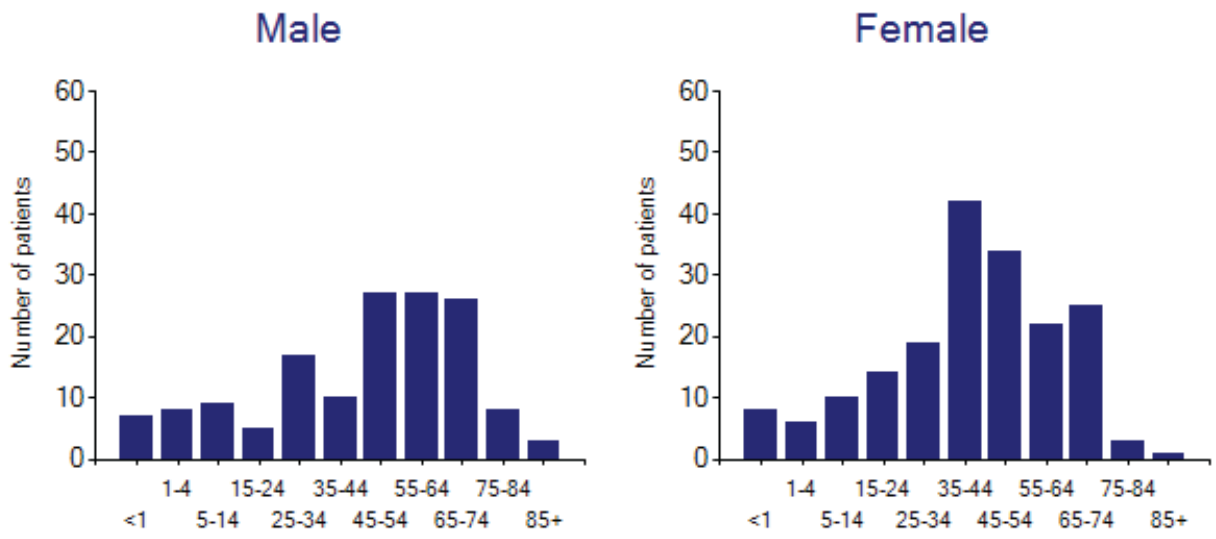


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	235	71
OPD	51	15.4
ICU	45	13.6

Table 2: Distribution of isolates by location.

2.3 Sample details

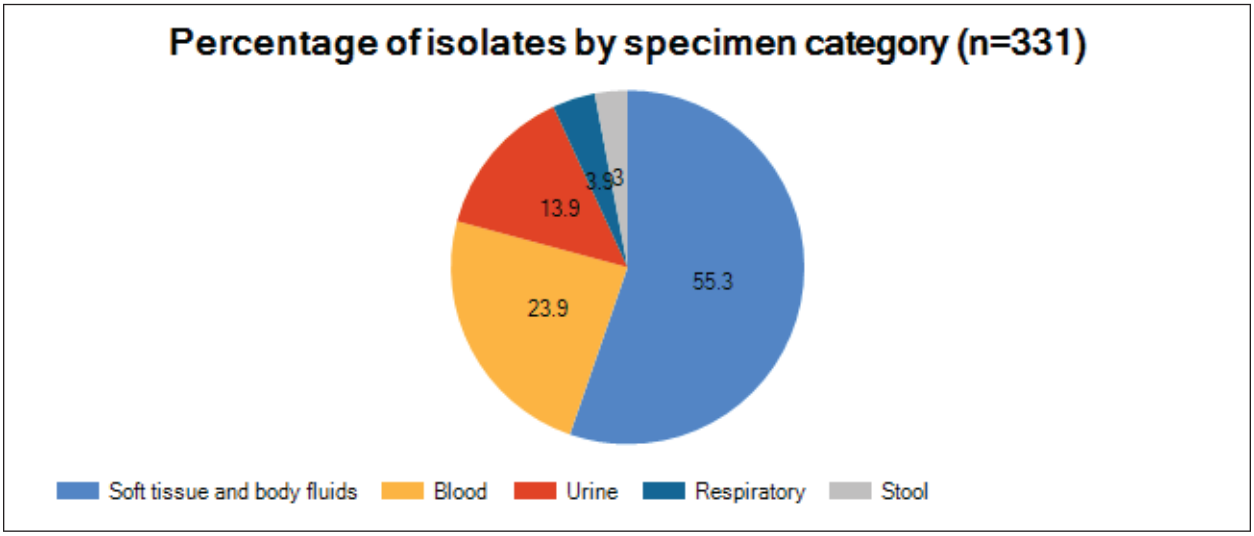


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	87	26.3
Aerobic Gram-negative bacteria	240	72.5
Fungi	4	1.2

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Staphylococcus aureus	84	25.4
Pseudomonas aeruginosa	63	19
Klebsiella pneumoniae	60	18.1
Acinetobacter spp.	46	13.9
Escherichia coli	43	13
Proteus spp.	15	4.5
Shigella spp.	8	2.4
Candida spp.	4	1.2
Other	3	0.9

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

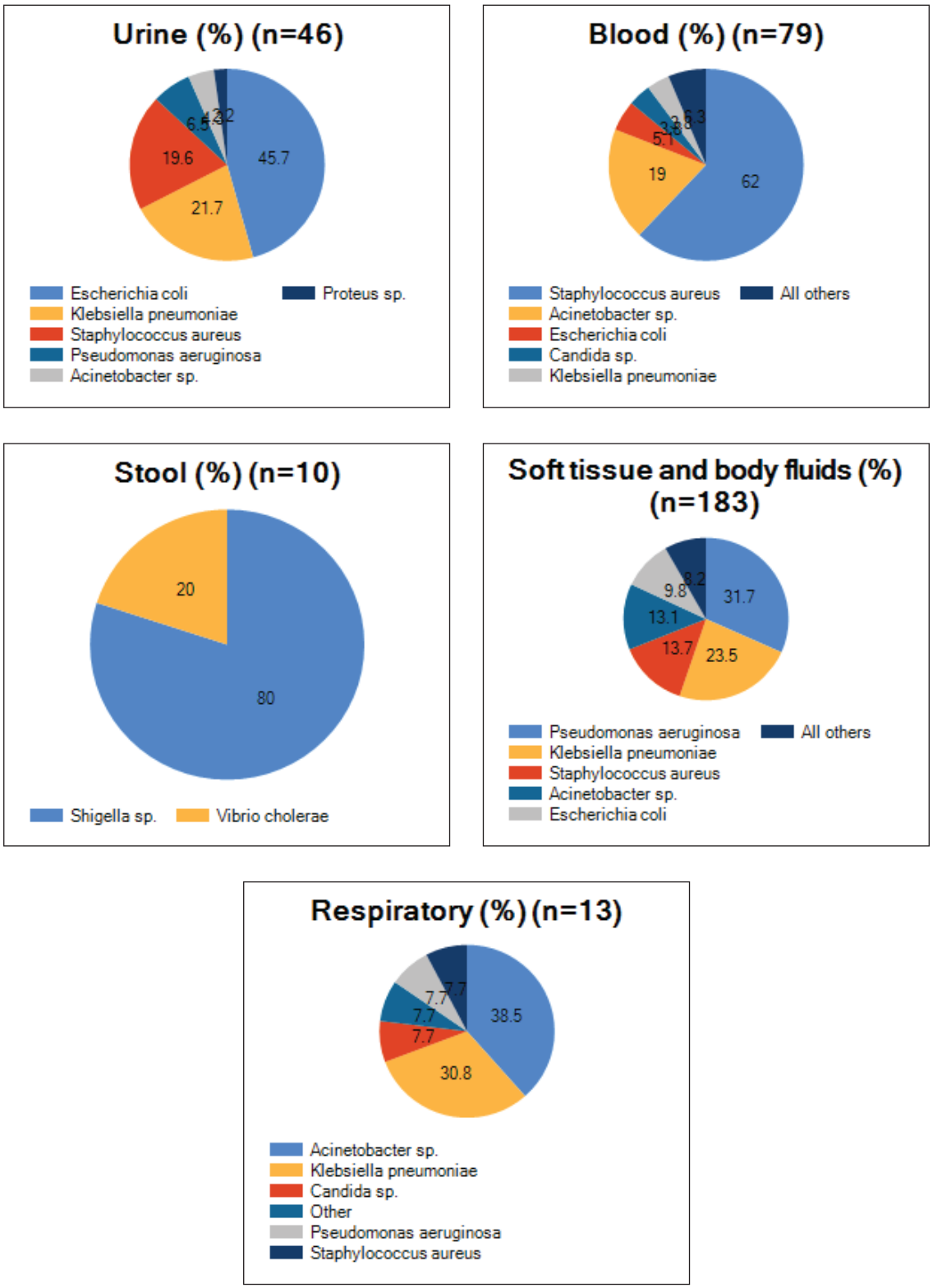


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	84	51 (61%)
Acinetobacter spp.	46	41 (89%)
E. coli	43	39 (91%)
K. pneumoniae	60	48 (80%)
P. aeruginosa	63	46 (73%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	Acinetobacter spp.	Carbapenem resistance	41/46 (89%)
	Pseudomonas aeruginosa	Carbapenem resistance	49/62 (79%)
	Escherichia coli	Cefotaxime-resistant	26/31 (84%)
	Escherichia coli	Ceftriaxone-resistant	33/43 (77%)
	Escherichia coli	Meropenem-resistant	14/43 (33%)
High	Enterococcus faecium	Vancomycin-resistant	-
	Staphylococcus aureus	Methicillin-resistant (MRSA)	50/82 (61%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	4/4 (100%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	Streptococcus pneumoniae	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	8/8 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of KMCH

Organism	Number of patients	Cefoxitin	Ciprofloxacin	Clindamycin	Doxycycline	Gentamicin	Linezolid
S. aureus	83	39	31	54	82	74	85

Table 7: Gram-positive antibiogram. %Susceptible, first isolate per patient

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Doxycycline	Gentamicin	Meropenem	Netilmicin	Piperacillin/ Tazobactam	Cefotaxime
P. aeruginosa	63			43	27	24			46			21	56	29	
K. pneumoniae	60	40		35	33	32	25	12	27		58	41		25	
Acinetobacter spp.	46	22			13	13	9		17	33	35	11		17	
E. coli	43	51	2	23	26	21	23	2	21		72	67		33	16

Table 8: Gram-negative antibiogram. %Susceptible, first isolate per patient

Uttara Adhunik Medical College Hospital

1. Data volume

Number of isolates	2023	2024
227	103	124

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 40.3%, Female - 59.7%
- Median age group: Male = 45-54, Female = 35-44

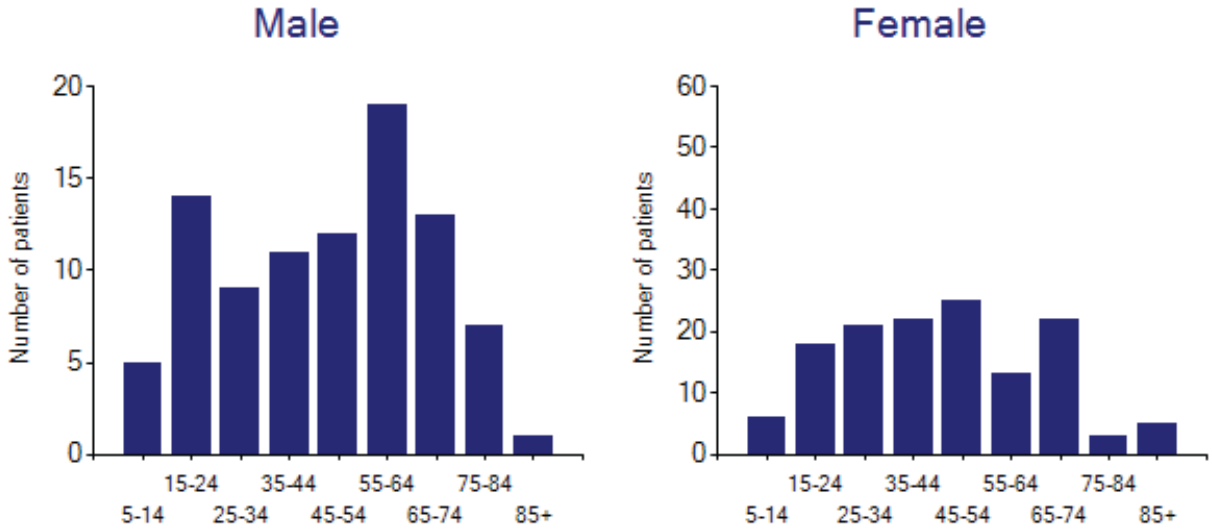


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	104	57.7
OPD	96	42.3
ICU	27	11.9

Table 2: Distribution of isolates by location.

2.3 Sample details

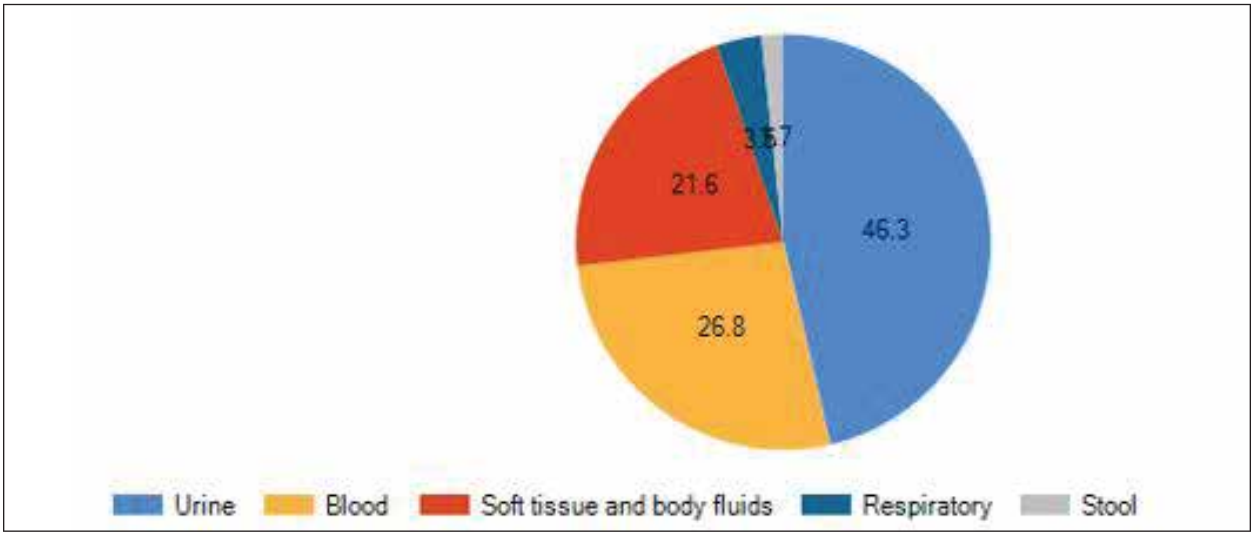


Figure 2: The figure shows the percentage of isolates stratified by specimen category (n=227)

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	20	8.8
Aerobic Gram-negative bacteria	206	90.7
Fungi	1	0.4

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	81	35.7
Klebsiella pneumoniae	53	23.3
Salmonella Typhi	39	17.2
Pseudomonas aeruginosa	17	7.5
Staphylococcus aureus	11	4.8
Enterococcus spp.	9	4
Enterobacter spp.	8	3.5
Proteus spp.	7	3.1
Acinetobacter spp.	1	0.4
Candida spp.	1	0.4

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

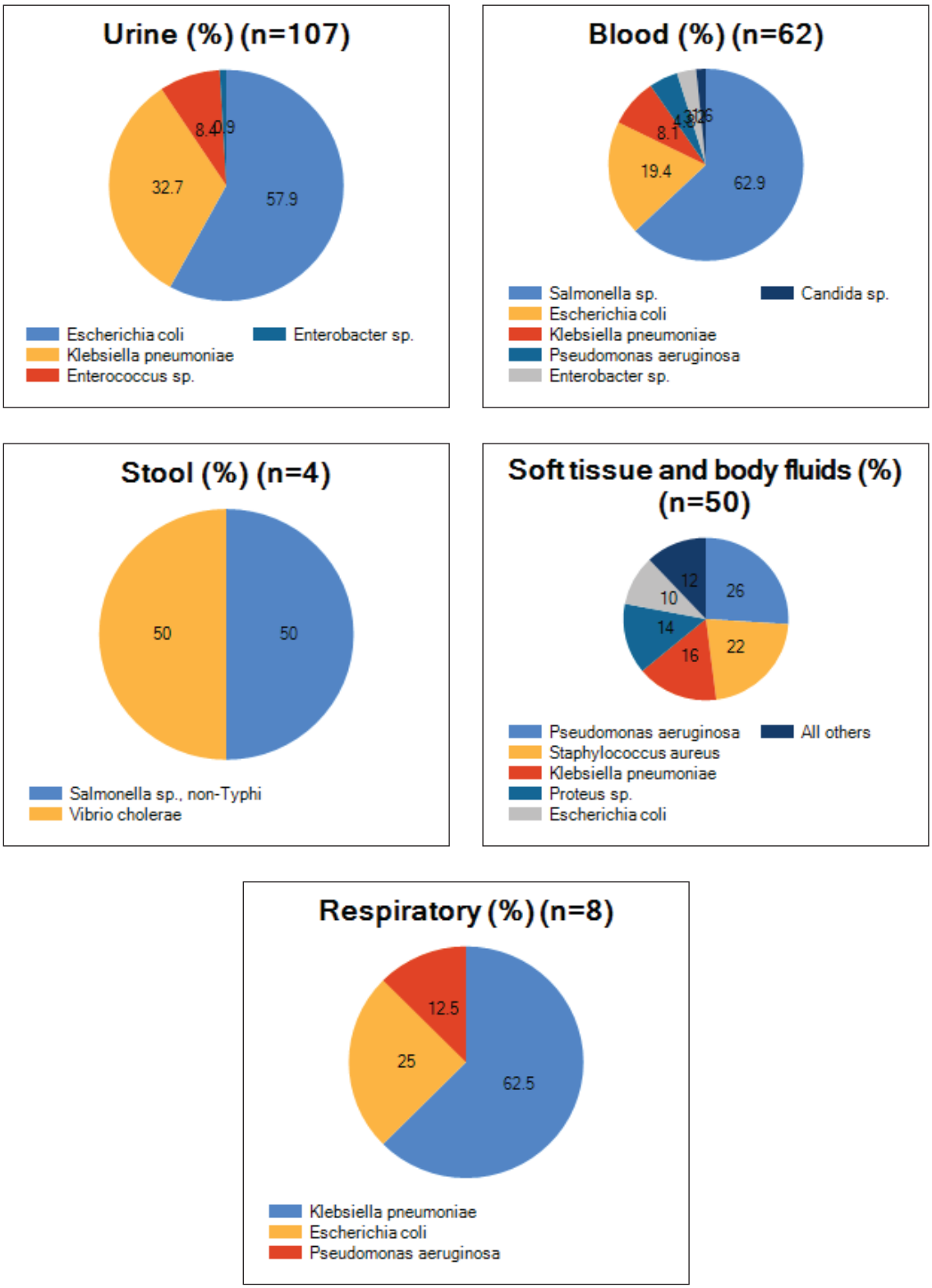


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
Staphylococcus aureus	11	4 (36%)
Escherichia coli	81	70 (86%)
Klebsiella pneumoniae	53	37 (70%)
Pseudomonas aeruginosa	17	6 (35%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	0/1 (0%)
	Pseudomonas aeruginosa	Carbapenem resistance	4/17 (24%)
	Escherichia coli	Cefotaxime-resistant	39/61 (64%)
	Escherichia coli	Ceftriaxone-resistant	49/80 (61%)
	Escherichia coli	Meropenem-resistant	0/81 (0%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	4/11 (36%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	39/39 (100%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	0/1 (0%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of UAMCH

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Fosfomycin	Gentamicin	Meropenem	Nitrofurantoin	Piperacillin/ Tazobactam	Levofloxacin	Cefotaxime	Tobramycin	Ceftazidime/Avibactam
E. coli	81	22	8	35	37	19	32	39	4	16	95	32	100	89	54		36	55	100
K. pneumoniae	53	43		58	53		55	58	8	42	100	55	87	37	44			74	67
Salmonella Typhi	39		87					100		0			100			85			

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

Cox's Bazar Medical College & Hospital

1. Data volume

Laboratory	Number of isolates	2023	2024
CoxMCH	278	163	115

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 44.2%, Female - 55.8%
- Median age group: Male = 35-44, Female = 25-34

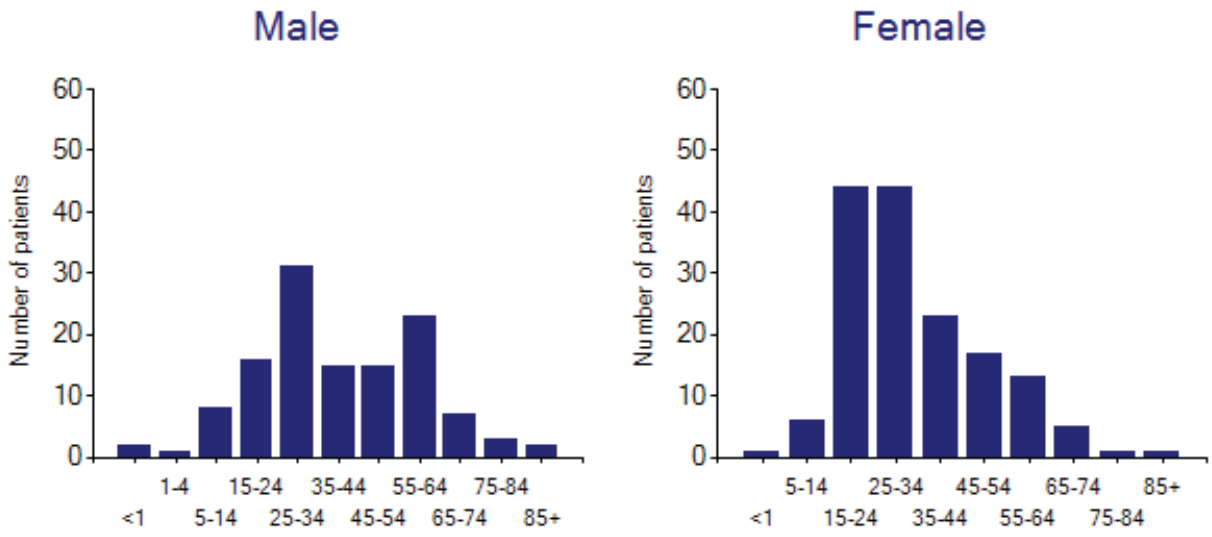


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	199	71.6
OPD	71	25.5
ICU	3	1.1
ORT	5	1.8

Table 2: Distribution of isolates by location.

2.3 Sample details

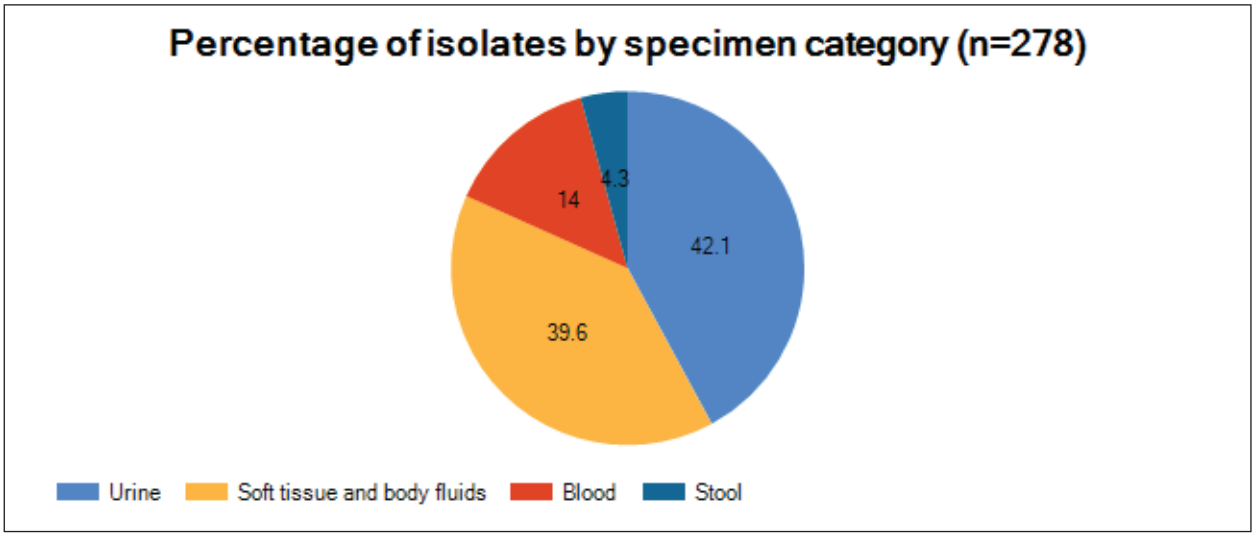


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	79	28.4
Aerobic Gram-negative bacteria	199	71.6

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	98	35.3
Staphylococcus aureus	79	28.4
Pseudomonas aeruginosa	51	18.3
Klebsiella pneumoniae	27	9.7
Vibrio cholerae	8	2.9
Enterobacter spp.	5	1.8
Proteus spp.	5	1.8
Salmonella spp.	4	1.4
Acinetobacter spp.	1	0.4

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

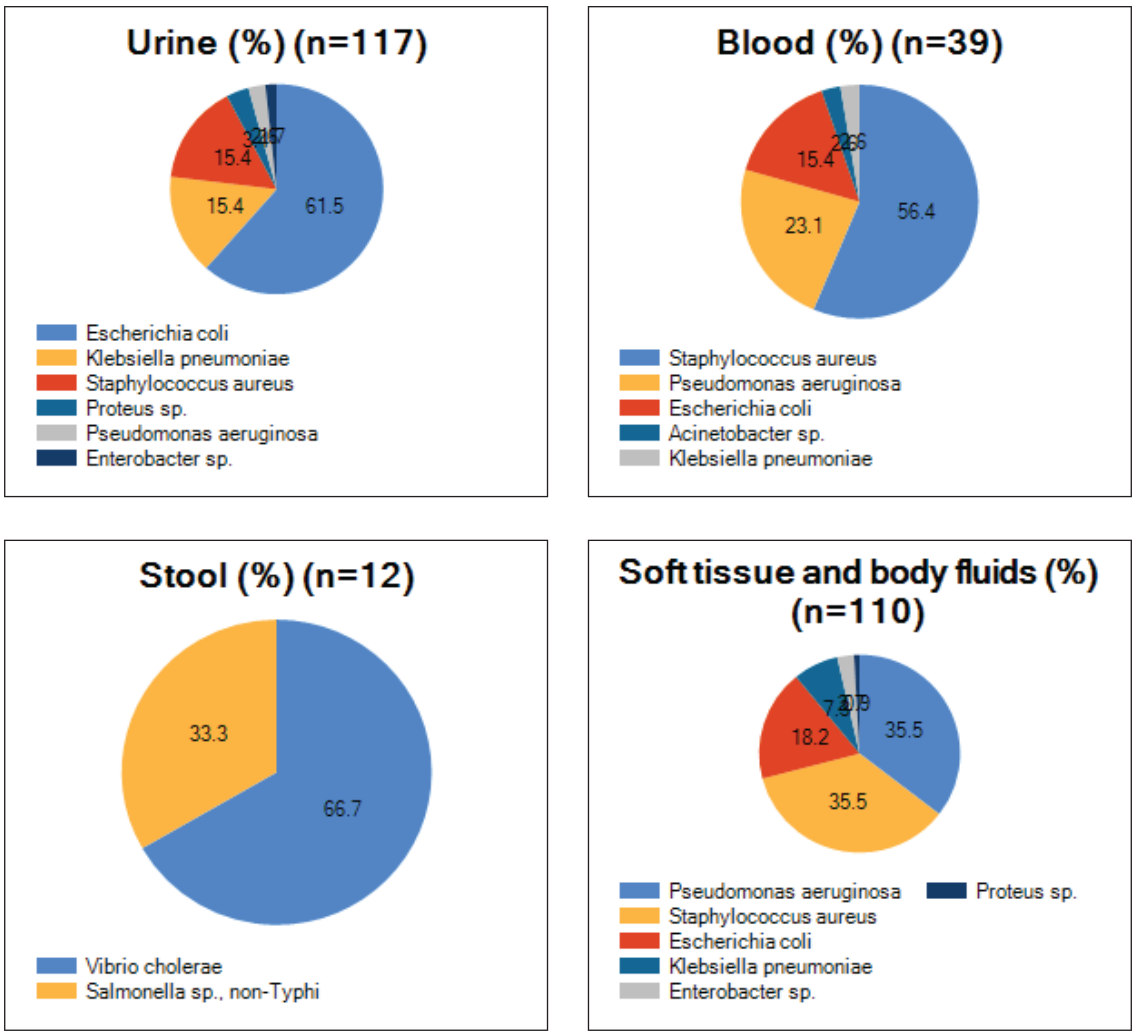


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
S. aureus	79	64 (81%)
Acinetobacter sp.	1	1 (100%)
E. coli	98	77 (79%)
K. pneumoniae	27	18 (67%)
P. aeruginosa	51	21 (41%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter spp.*	Carbapenem resistance	1/1 (100%)
	Pseudomonas aeruginosa	Carbapenem resistance	16/27 (59%)
	Escherichia coli	Cefotaxime-resistant	-
	Escherichia coli	Ceftriaxone-resistant	71/98 (72%)
	Escherichia coli	Meropenem-resistant	60/86 (70%)
High	*Enterococcus faecium*	Vancomycin-resistant	0/1 (0%)
	Staphylococcus aureus	Methicillin-resistant (MRSA)	63/78 (81%)
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	4/4 (100%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	5/5 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of CoxMCH

Organism	Number of patients	Oxacillin	Ciprofloxacin	Clindamycin	Doxycycline	Gentamycin	Linezolid	Oxacillin	Rifampicin
Staphylococcus aureus	79	19	49	64	87	73	86	3	81

Table 7: Gram-positive antibiogram. %Susceptible, first isolate per patient

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Gentamycin	Meropenem	Nitrofurantoin	Piperacillin-tazobactam
E. coli	98	62	8	43	52	28	28	8	35	74	30	65	62
P. aeruginosa	51			62	61	41			61		41		63
K. pneumoniae	27	78		67	68	41	59	22	41	82	20		59

Table 8: Gram-negative antibiogram. %Susceptible, first isolate per patient

Bangladesh Institute of Tropical and Infectious Diseases

1. Data volume

Number of isolates	2023	2024
92	64	28

Table 1: The number of isolates by laboratory over time.

2. Patient and sample details

2.1 Patient demographics

The distribution of patients by sex and age group is displayed in the below figures.

- Sex: Male - 35.9%, Female - 64.1%
- Median age group: Male = 35-44, Female = 35-44

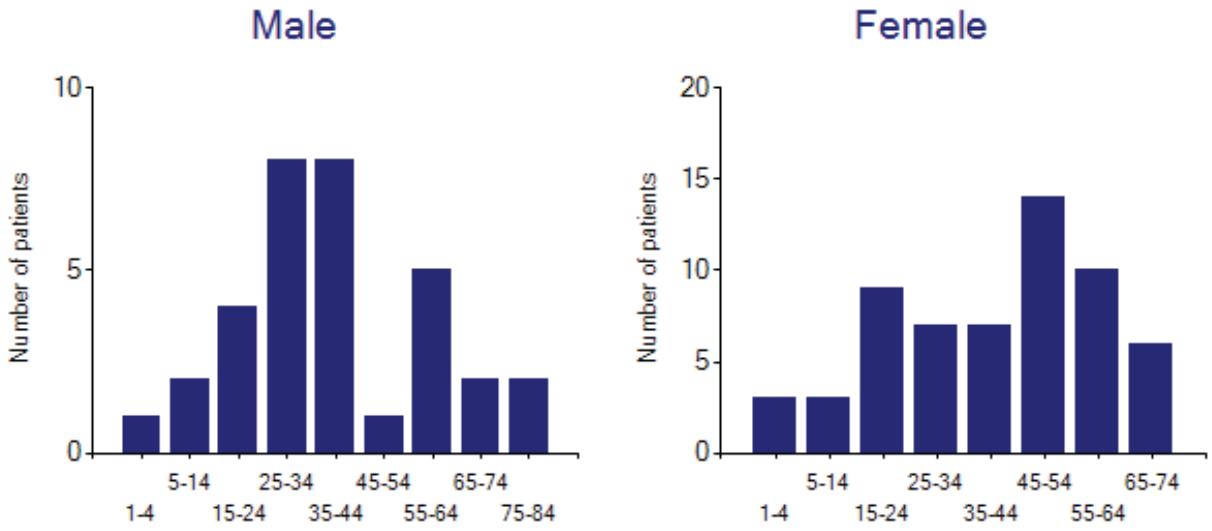


Figure 1: Distribution of patients by sex and age group

2.2 Location details

Location	Number of isolates	(%)
IPD	65	70.7
OPD	27	29.3
ICU	-	-

Table 2: Distribution of isolates by location.

2.3 Sample details

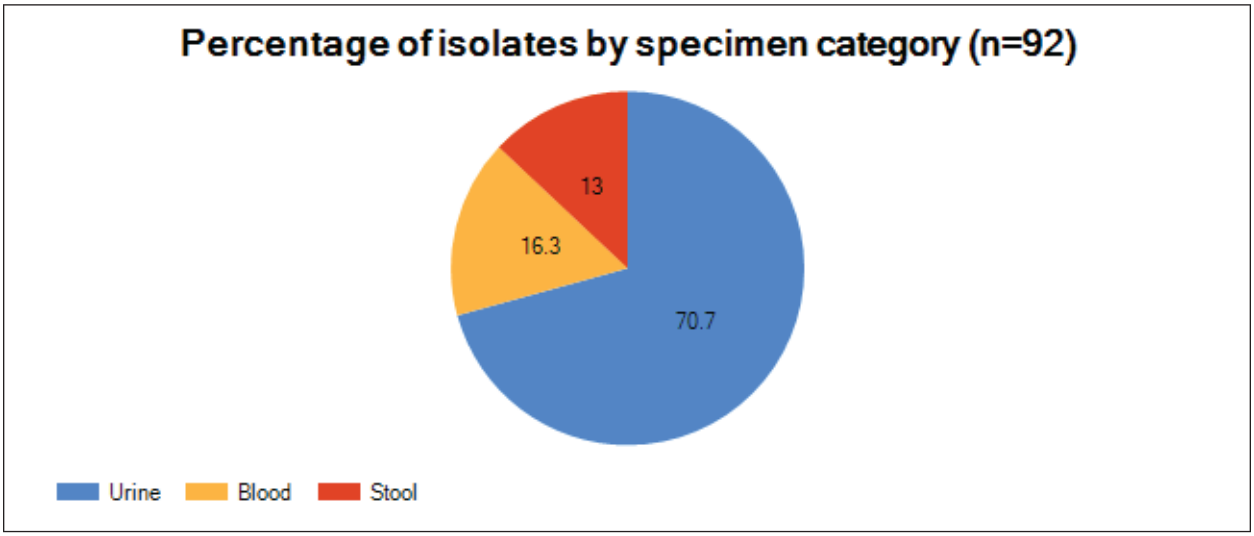


Figure 2: The figure shows the percentage of isolates stratified by specimen category

3. Organism statistics

3.1 Organism frequencies

Organism type	Number of isolates	(%)
Aerobic Gram-positive bacteria	5	5.4
Aerobic Gram-negative bacteria	87	94.6

Table 3: Distribution of results by organism type.

Organism	Number of isolates	(%)
Escherichia coli	54	58.7
Salmonella spp.	13	14.1
Vibrio cholerae	8	8.7
Klebsiella pneumoniae	7	7.6
Enterococcus spp.	4	4.3
Shigella spp.	2	2.2
Salmonella spp.	2	2.2
Pseudomonas aeruginosa	1	1.1
Staphylococcus spp.	1	1.1

Table 4: Distribution of the most common organism results.

3.2 Organism frequencies by specimen categories

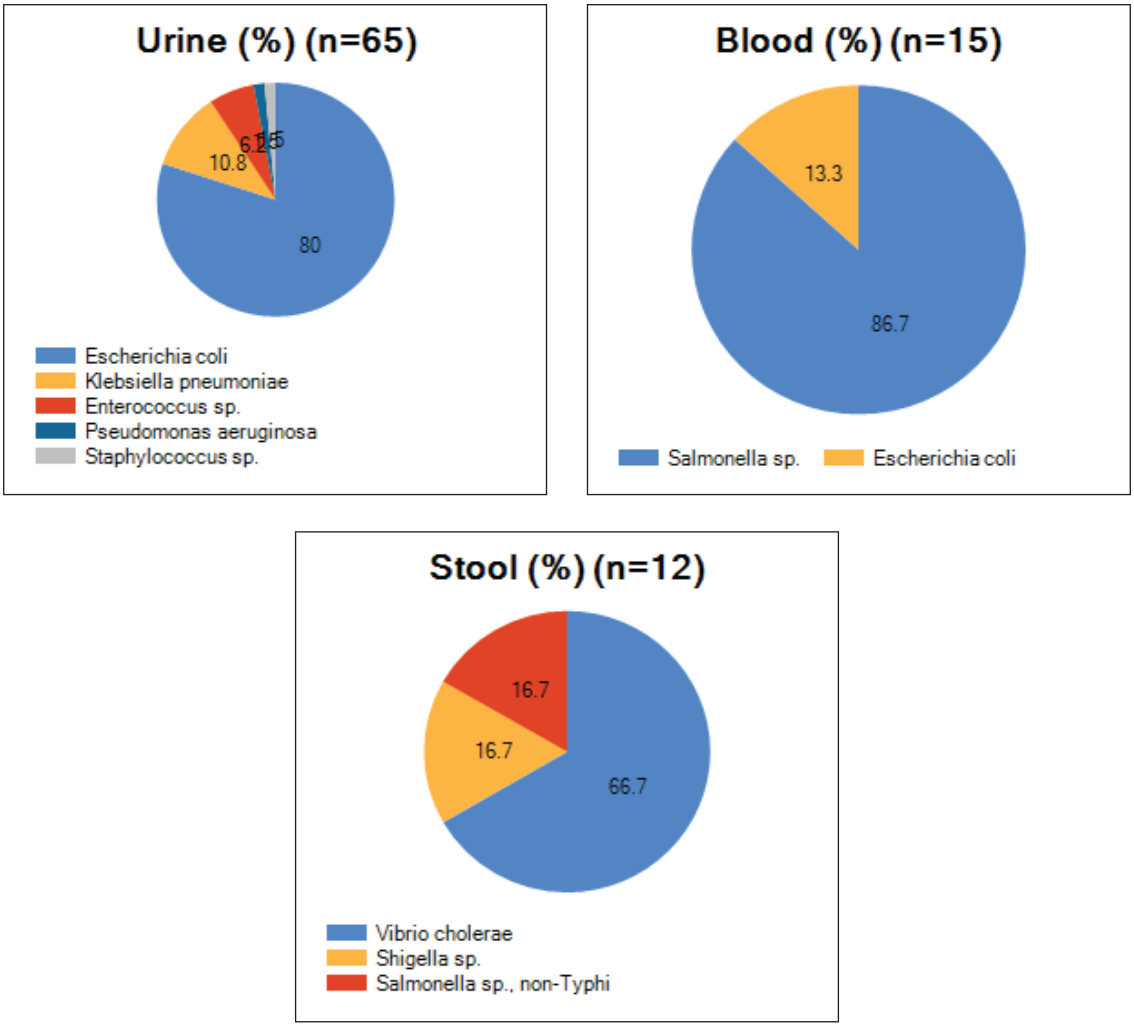


Figure 3: Most common organisms by specimen category. Numbers represent the percentage of isolates.

4. Antimicrobial statistics

4.1 Multidrug resistance:

MDR results are summarized in the below table.

Organism	Number of isolates	MDR
Escherichia coli	54	49 (91%)
Klebsiella pneumoniae	7	4 (57%)

Table 5: MDR summary

5. Distribution of WHO Global Priority List of Antibiotic-Resistant Bacteria

Priority	Organism	Antibiotic results	Number (%)
Critical	*Acinetobacter* spp.	Carbapenem resistance	-
	Pseudomonas aeruginosa	Carbapenem resistance	-
	Escherichia coli	Cefotaxime-resistant	30/48 (63%)
	Escherichia coli	Ceftriaxone-resistant	34/53 (64%)
	Escherichia coli	Meropenem-resistant	2/44 (5%)
High	*Enterococcus faecium*	Vancomycin-resistant	-
	Staphylococcus aureus	Methicillin-resistant (MRSA)	-
	Staphylococcus aureus	Vancomycin-resistant	-
	Staphylococcus aureus	Vancomycin-intermediate	-
	Salmonella spp.	Fluoroquinolone-resistant (Ciprofloxacin)	14/15 (93%)
	Neisseria gonorrhoeae	Third generation cephalosporin-resistant	-
	Neisseria gonorrhoeae	Fluoroquinolone-resistant	-
Medium	*Streptococcus pneumoniae*	Penicillin non-susceptible	-
	Haemophilus influenzae	Ampicillin-resistant	-
	Shigella spp.	Fluoroquinolone-resistant	2/2 (100%)

Table 6: WHO Global priority list of antibiotic-resistant bacteria

Antibiogram of BITID

Organism	Number of patients	Amikacin	Ampicillin	Aztreonam	Cefepime	Cefixime	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Fosfomycin	Gentamicin	Meropenem	Nitrofurantoin	Piperacillin/Tazobactam	Cefotaxime
E. coli	54	37	18	32	43	24	35	36	11	7	98	67	96	88	56	38

Table 7: Gram-negative antibiogram. %Susceptible, first isolate per patient

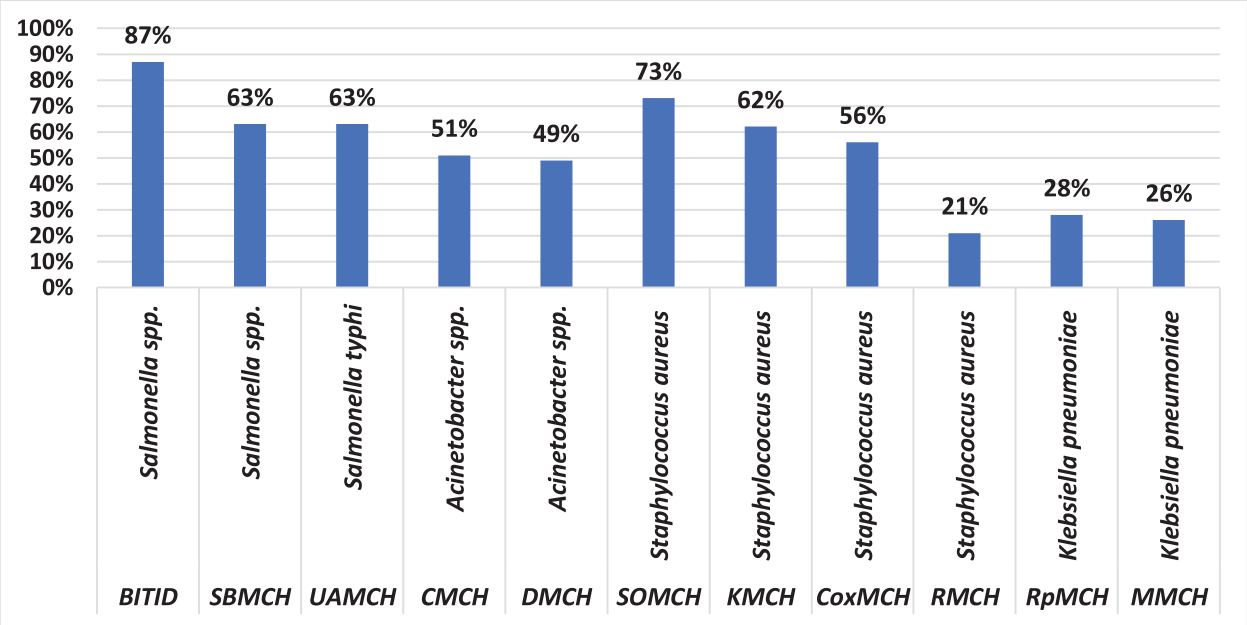


Figure 50: Distribution of pathogen in blood in different sites

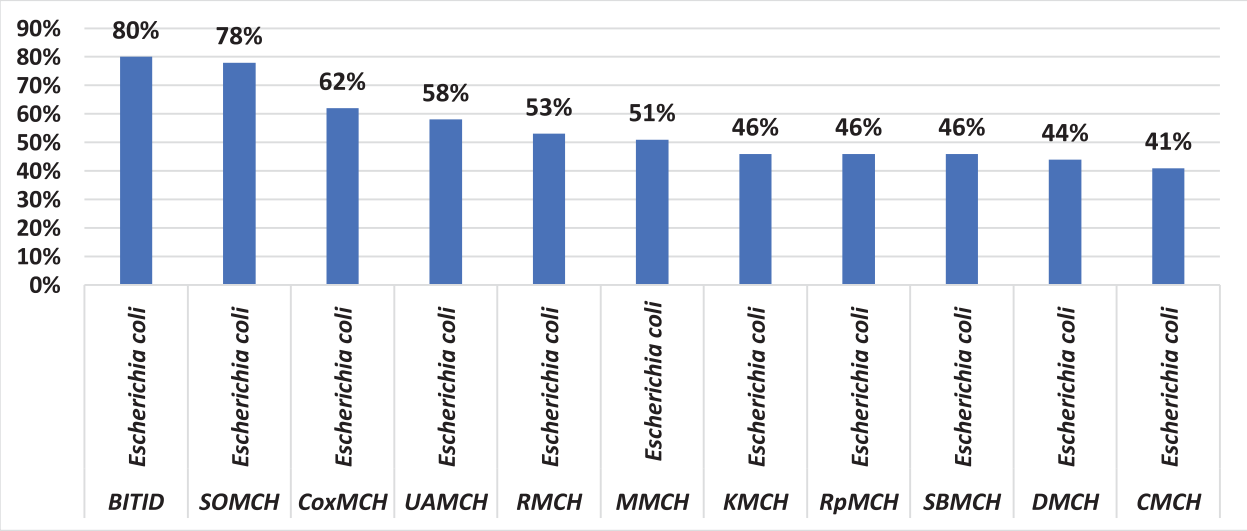


Figure 51: Distribution of pathogen in urine in different sites

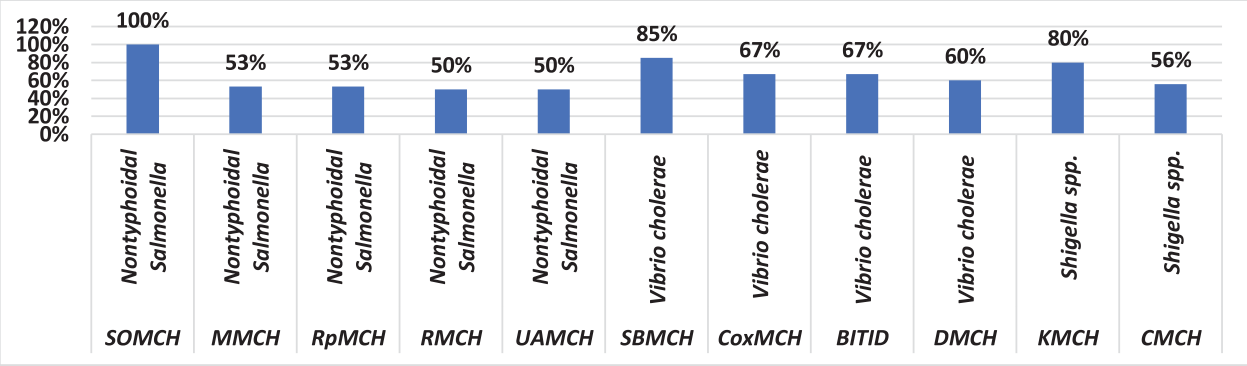


Figure 52: Distribution of pathogen in stool in different sites

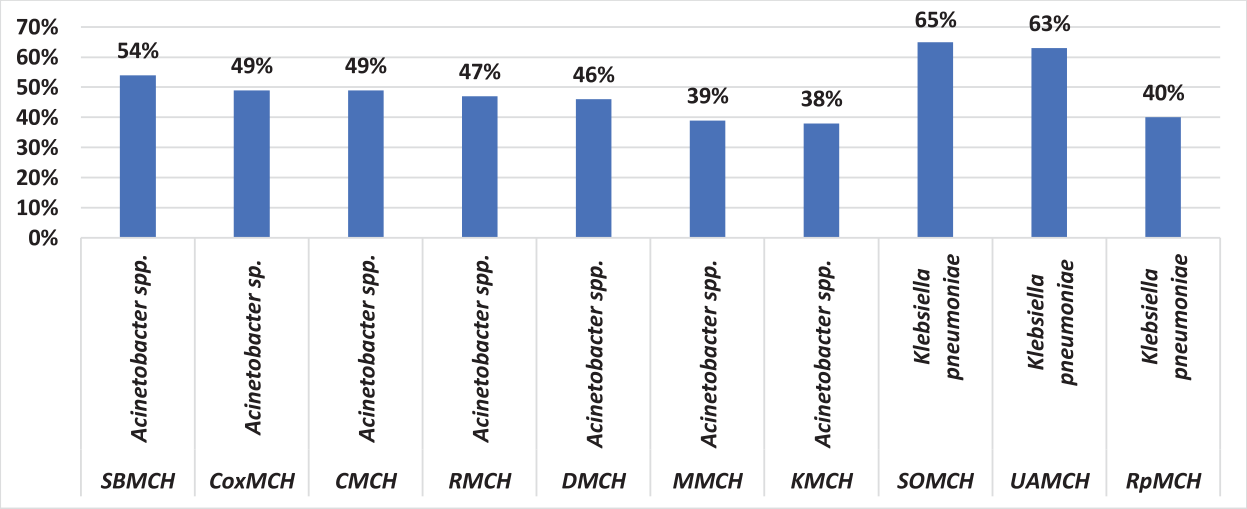


Figure 53: Distribution of pathogen in ETA in different sites

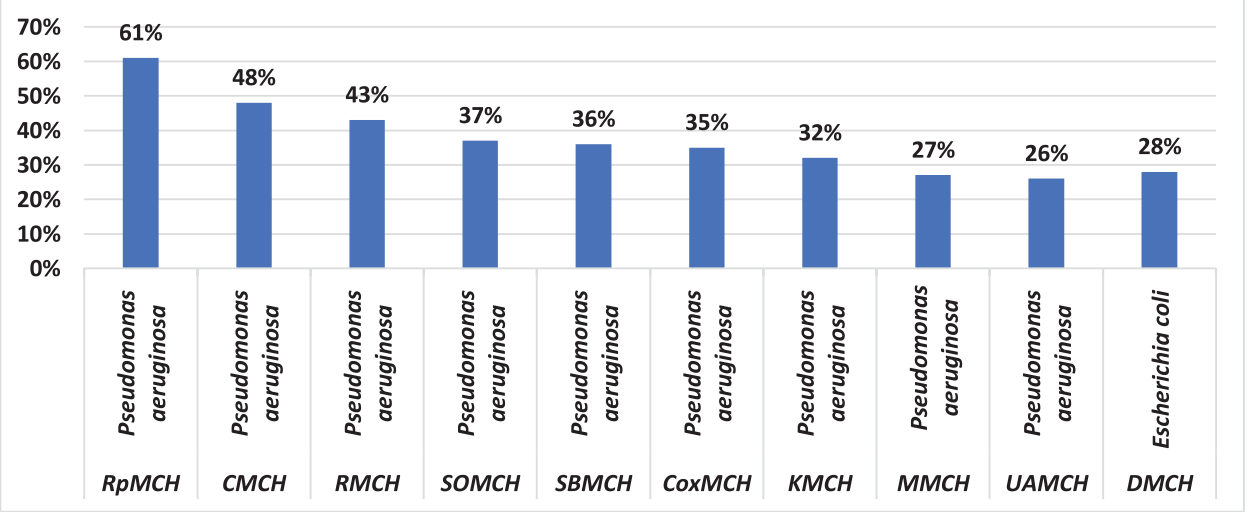


Figure 54: Distribution of pathogen in wound swab in different sites

Table 12: Distribution of critical priority pathogen in different medical colleges

Medical College	Critical Priority Pathogen-1 *(Carbapenem resistant Acinetobacter spp.)*	Critical Priority Pathogen-2 *(Carbapenem resistant E. coli)*	Critical Priority Pathogen-3 3GCR *(Ceftriaxone resistant E. coli)*	Critical Priority Pathogen-4 3GCR *(Cefotaxime resistant E. coli)*
DMCH	88%	47%	92%	-
MMCH	95%	43%	77%	-
RMCH	98%	36%	82%	78%
RpMCH	-	29%	81%	71%
CMCH	79%	33%	84%	-
SBMCH	61%*	14%	62%	-
SOMCH	-	-	81%	-
KMCH	89%	33%	77%	84%
UAMCH	-	0%	61%	64%
COxMCH	-	70%	72%	-
BITID	-	5%	64%	63%

*sample size less than 30

Antibiotic Use of All Sites (2023-2024)

In case-based surveillance, antibiotic usage data is collected directly from patients. As a result, we have a database of 12,326 recorded instances of antibiotic use from July 2023 to June 2024.

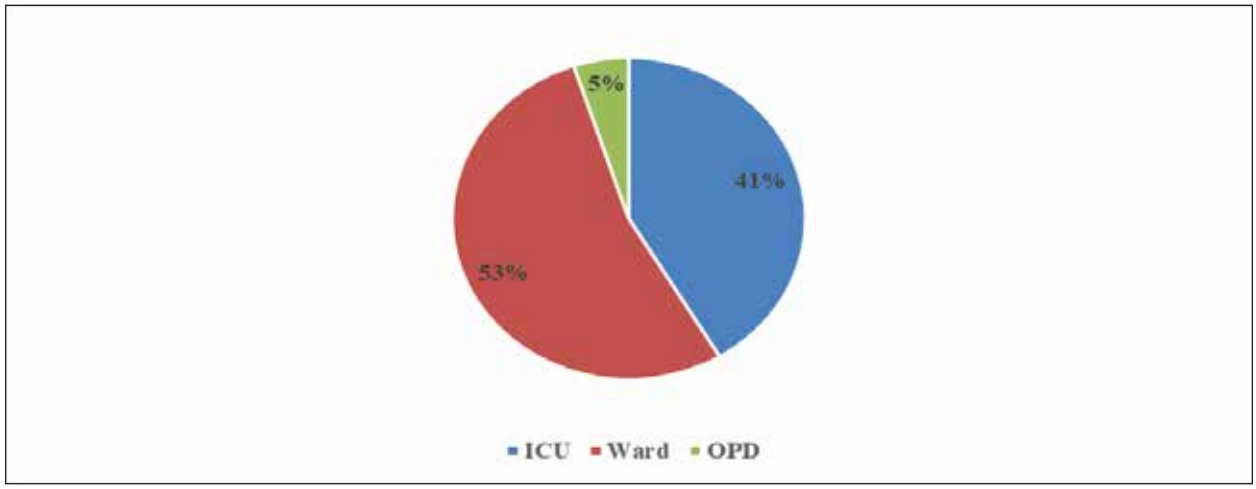


Figure 55: Distribution of Antibiotic usage in different locations (n=12,326)

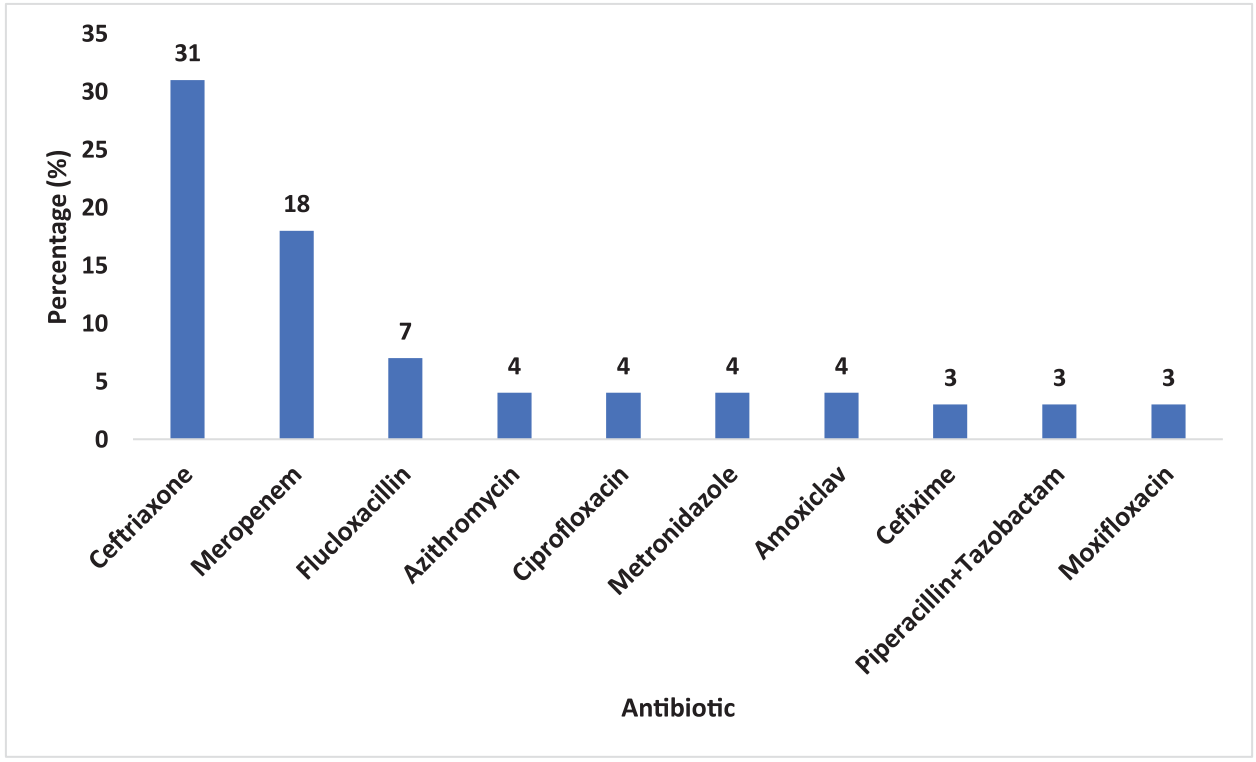


Figure 56: Ten Most commonly used antibiotics (n=12,326)

Table 13: Ten Most commonly used antibiotics in different locations

Sl	ICU (n=5,000)	Ward (n=6,538)	OPD (n=675)
1	Meropenem (33.9%)	Ceftriaxone (39.6%)	Cefixime (12.7%)
2	Ceftriaxone (22.2%)	Flucloxacillin (8.7%)	Ceftriaxone (12.6%)
3	Piperacillin+Tazobactam (6.5%)	Meropenem (8.1%)	Ciprofloxacin (10.5%)
4	Moxifloxacin (5.4%)	Azithromycin (7.0%)	Azithromycin (8.4%)
5	Flucloxacillin (4.7%)	Ciprofloxacin (6.7%)	Cefuroxime Axetil + Clavulanic Acid (6.7%)
6	Metronidazole (4.3%)	Amoxiclav (5.6%)	Levofloxacin (5.3%)
7	Vancomycin (4.1%)	Cefixime (4.6%)	Flucloxacillin (5.2%)
8	Clindamycin (3.1%)	Metronidazole (4.3%)	Cefuroxime Axetil (4.9%)
9	Linezolid (2.3%)	Cefuroxime (2.3%)	Amoxiclav (4.6%)
10	Amoxiclav (2.0%)	Amikacin (1.4%)	Clindamycin (3.7%)

Table 14: Antibiotic usage according to cases

Sl	Wound infection (n= 2,640)	UTI (n= 1,716)	Blood stream infection (n= 5,272)	LRTI, ETA (n= 1,535)	Diarrhea (n= 2,010)
1	Ceftriaxone (29.1%)	Ceftriaxone (34.9%)	Ceftriaxone (38.6%)	Meropenem (38.0%)	Azithromycin (38.8%)
2	Flucloxacillin (20.0%)	Meropenem (18.4%)	Meropenem (22.0%)	Ceftriaxone (14.5%)	Ciprofloxacin (35.4%)
3	Metronidazole (6.9%)	Flucloxacillin (5.8%)	Amoxiclav (5.0%)	Piperacillin+ Tazobactam (6.8%)	Ceftriaxone (16.0%)
4	Meropenem (6.8%)	Piperacillin+ Tazobactam (4.8%)	Moxifloxacin (3.5%)	Metronidazole (5.5%)	Metronidazole (5.6%)
5	Cefixime (6.4%)	Cefixime (4.6%)	Flucloxacillin (3.2%)	Clindamycin (5.0%)	Doxycycline (1.4%)
6	Amoxiclav (6.2%)	Ciprofloxacin (4.5%)	Piperacillin+ Tazobactam (3.2%)	Moxifloxacin (4.7%)	Meropenem (0.5%)
7	Cefuroxime (4.5%)	Azithromycin (2.2%)	Vancomycin (2.9%)	Vancomycin (4.6%)	Amikacin (0.4%)
8	Linezolid (3.3%)	Vancomycin (2.2%)	Metronidazole (2.9%)	Flucloxacillin (2.8%)	Ceftazidime (0.4%)
9	Levofloxacin (2.3%)	Moxifloxacin (2.0%)	Cefixime (2.8%)	Linezolid (2.7%)	Vancomycin (0.3%)
10	Ciprofloxacin (1.9%)	Amoxiclav (2.0%)	Azithromycin (2.0%)	Amikacin (2.3%)	Amoxiclav (0.2%)

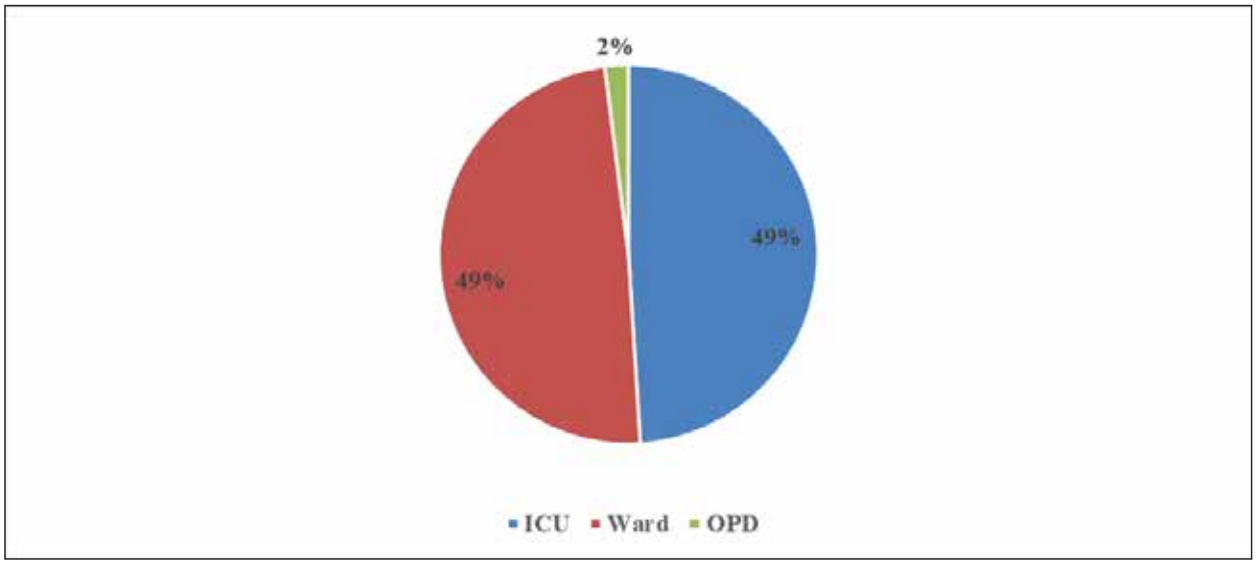


Figure 57: Distribution of antibiotics used in blood stream infection in different locations (n=5,361)

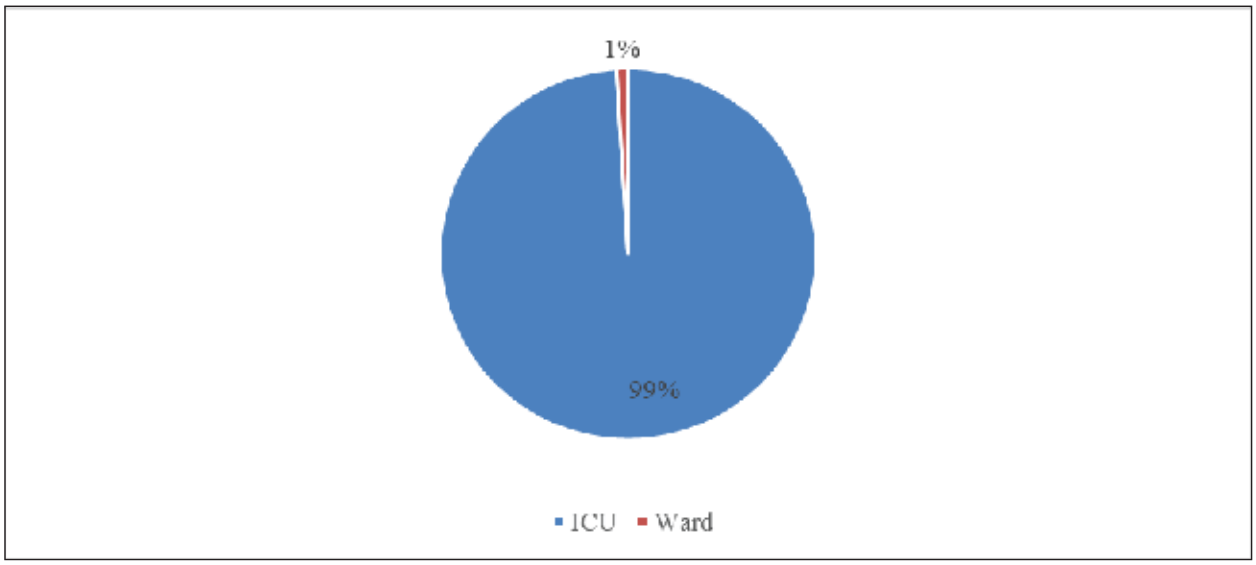


Figure 58: Distribution of antibiotics used in LRTI patients of different locations (n=1,563)

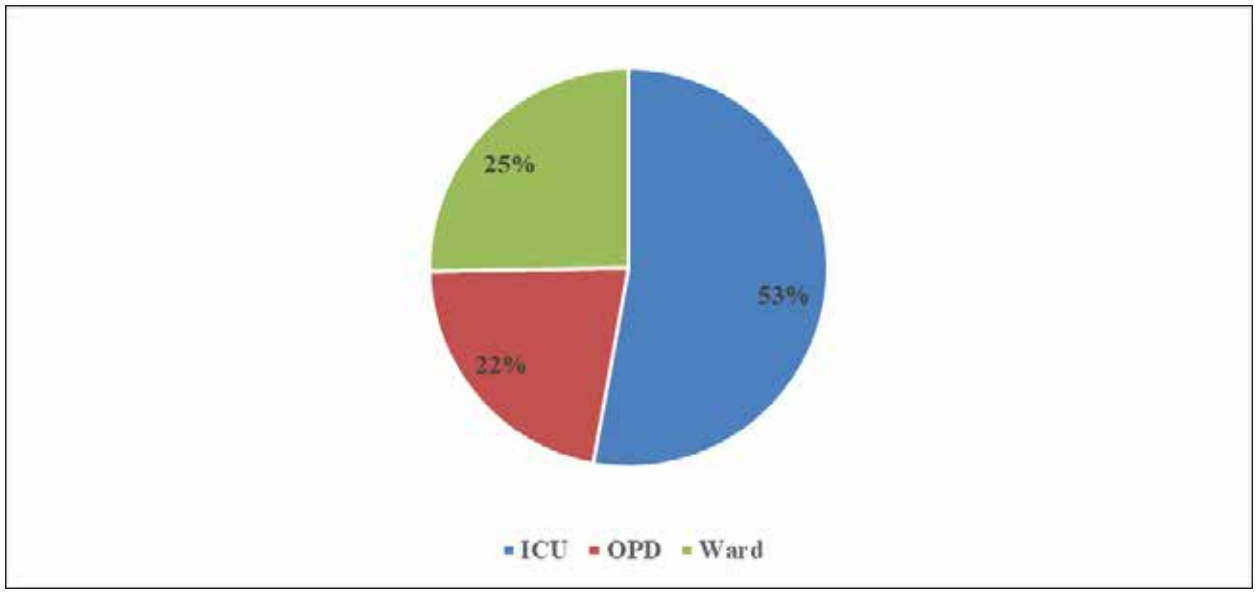


Figure 59: Distribution of antibiotics used in UTI in different locations (n=1,767)

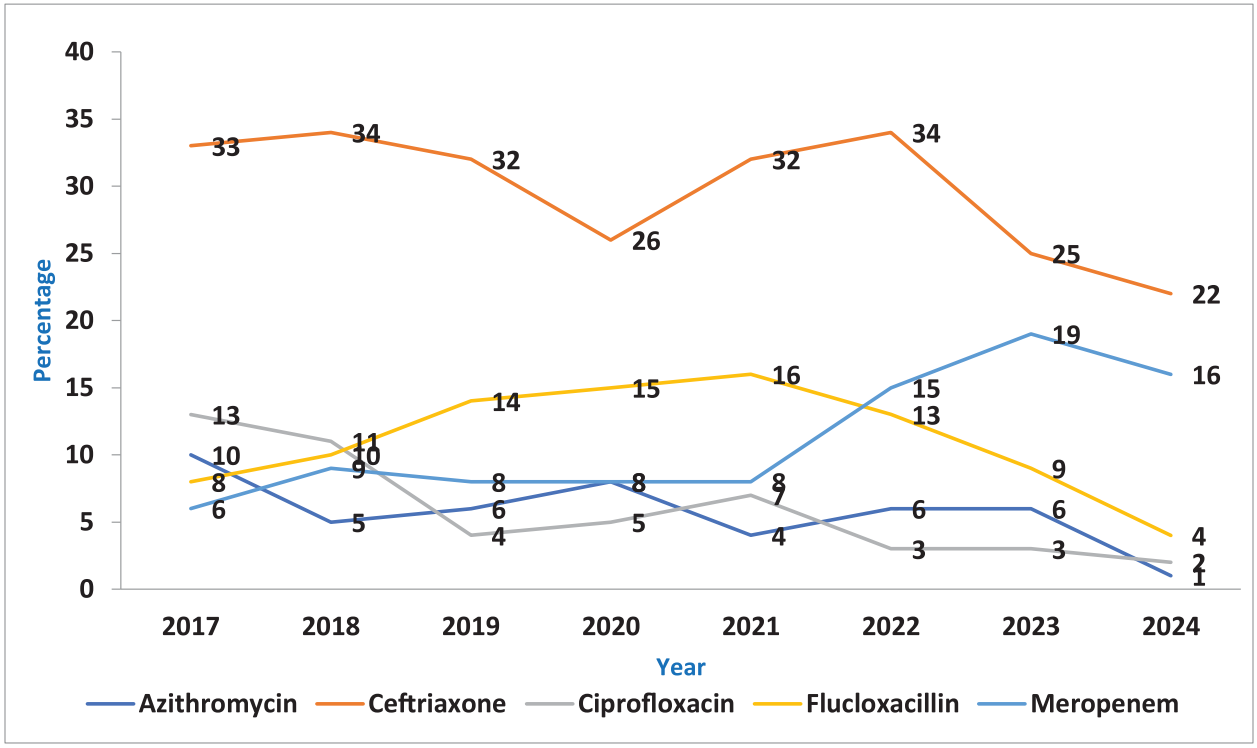


Figure 60: Yearly Trend of five most used antibiotics

Table 15: Ten most commonly used antibiotics in different sites

DMCH (n=1592)	UAMCH (n=1195)	MMCH (n=1697)	RMCH (n=2458)	RpMCH (n=742)	SBMCH (n=834)	SOMCH (n=548)	KMCH (n=1107)	CoxMCH (n=798)	CMCH (n=1158)
Meropenem (25.6%)	Ceftriaxone (24.0%)	Ceftriaxone (40.0%)	Ceftriaxone (40.2%)	Ceftriaxone (29.6%)	Ceftriaxone (41.2%)	Ceftriaxone (43.8%)	Ceftriaxone (25.3%)	Ceftriaxone (28.6)	Ceftriaxone (31.8%)
Metronidazole (10.1%)	Meropenem (23.3%)	Meropenem (13.4%)	Meropenem (22.5%)	Meropenem (20.2%)	Azithromycin (24.0%)	Meropenem (16.6%)	Meropenem (16.2%)	Flucloxacillin (16.4%)	Amoxiclav (17.4%)
Ceftriaxone (9.5%)	Moxifloxacin (13.3%)	Ciprofloxacin (8.1%)	Flucloxacillin (8.4%)	Cefixime (12.9%)	Meropenem (8.8%)	Metronidazole (6.6%)	Flucloxacillin (12.3%)	Ciprofloxacin (14.8%)	Meropenem (16.1%)
Clindamycin (8.0%)	Metronidazole (4.6%)	Metronidazole (7.8%)	Piperacillin+ Tazobactam (5.5%)	Piperacillin+ Tazobactam (7.3%)	Amoxiclav (5.4%)	Ciprofloxacin (5.3%)	Cefixime (7.9%)	Azithromycin (14.7%)	Ciprofloxacin (9.7%)
Vancomycin (7.3%)	Clindamycin (3.8%)	Flucloxacillin (7.7%)	Azithromycin (3.2%)	Flucloxacillin (7.0%)	Flucloxacillin (4.3%)	Flucloxacillin (5.1%)	Amoxiclav (4.2%)	Meropenem (12.4%)	Piperacillin+ Tazobactam (3.5%)
Amikacin (5.0%)	Linezolid (3.7%)	Amoxiclav (4.8%)	Vancomycin (3.0%)	Moxifloxacin (4.7%)	Cefixime (3.5%)	Levofloxacin (3.5%)	Cefuroxime+ Clavulanic Acid (3.5%)	Metronidazole (5.9%)	Flucloxacillin (2.9%)
Piperacillin+ Tazobactam (5.0%)	Amoxiclav (3.1%)	Doxycycline (3.9%)	Cefixime (2.7%)	Levofloxacin (4.0%)	Levofloxacin (2.3%)	Azithromycin (3.3%)	Vancomycin (3.1%)	Amoxiclav (1.5%)	Cefixime (2.3%)
Linezolid (4.0%)	Cefuroxime Axetil+ Clavulanic Acid (3.1%)	Cefixime (3.3%)	Doripenem (2.2%)	Azithromycin (3.6%)	Ciprofloxacin (2.2%)	Clindamycin (2.4%)	Azithromycin (3.0%)	Cefuroxime (1.3%)	Amikacin (2.0%)
Flucloxacillin (3.2%)	Flucloxacillin (2.9%)	Azithromycin (1.8%)	Cefuroxime (2.1%)	Metronidazole (3.0%)	Metronidazole (1.8%)	Amikacin (2.0%)	Cefuroxime (2.9%)	Linezolid (1.0%)	Linezolid (1.8%)
Moxifloxacin (3.1%)	Piperacillin+ Tazobactam (2.4%)	Vancomycin (1.2%)	Moxifloxacin (1.6%)	Ciprofloxacin (1.9%)	Cefuroxime Axetil+ Clavulanic Acid (0.7%)	Amoxiclav (2.0%)	Ciprofloxacin (2.9%)	Clindamycin (0.6%)	Metronidazole (1.8%)

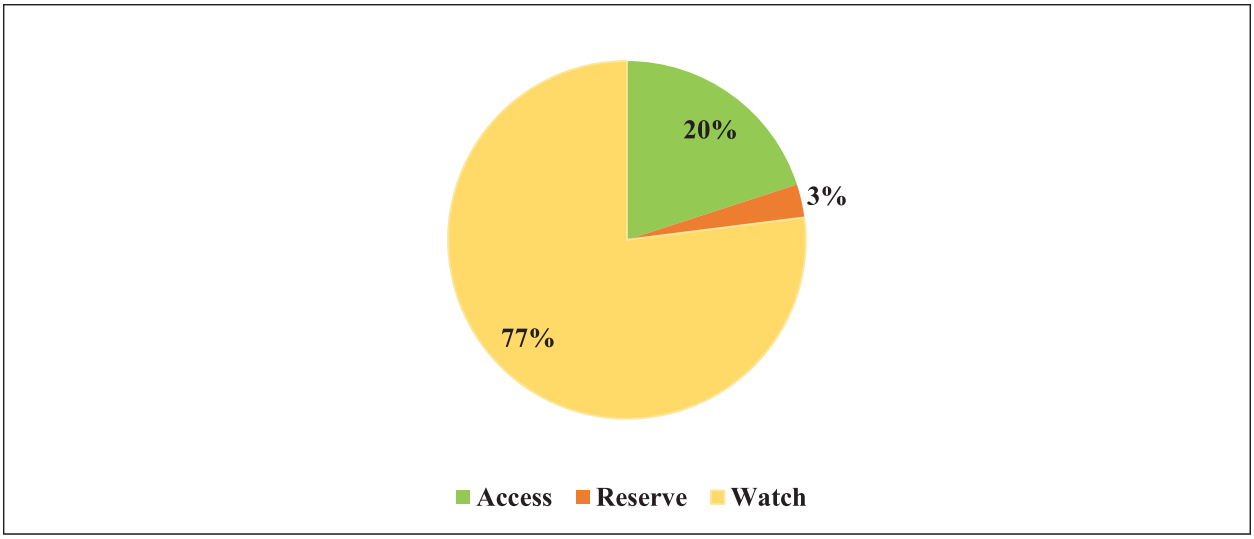


Figure 61: Distribution of AWaRe drug (n=12,326)

Table 16: Distribution of usage of reserve drug

Reserve Drug	N=348	
	n	(%)
Linezolid	213	61
Tigecycline	67	19
Ceftazidime+Avibactam	42	12
Colistin	15	4
Aztreonam	6	2
Polymixin B	5	1

Table 17: Utilization of reserve drugs across hospital departments

Department	Reserve Drug	Total
	n (%)	N
ICU	235 (67.5)	5002
Surgery	63 (18.1)	2129
Medicine	22 (6.3)	3189
Gynae and Obs	4 (1.1)	232
Pediatrics	2 (0.6)	91
Burn	1 (0.3)	14
Others	21(6.0)	1485

Table 18: Distribution of antibiotic usage in various hospital departments for reserve antibiotics

Department	Aztreonam	Ceftazidime + Avibactam	Colistin	Linezolid	Polymyxin B	Tigecycline	Total
Burn	-	-	-	1 (100%)	-	-	1
Gyne and Obs	-	-	-	1 (25%)	-	3 (75%)	4
ICU	4 (2%)	42 (18%)	9 (4%)	114 (49%)	4 (2%)	62 (26%)	235
Medicine	1 (4.5%)	-	4 (18.2%)	14 (63.6%)	1 (4.5%)	2 (9.1%)	22
Surgery	-	-	2 (3.2%)	61 (96.8)	-	-	63
Pediatrics	-	-	-	2 (100%)	-	-	2
Others	1 (4.8%)	-	-	20 (95.2%)	-	-	21
Total							**348**

Table 19: Usage of Reserve drugs in different locations

Locations	Aztreonam	Ceftazidime	Colistin	Linezolid	Polymyxin B	Tigecycline	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	N
ICU	4 (1.7)	42 (17.9)	9 (3.8)	114 (48.5)	4 (1.7)	62 (26.4)	235
Ward	2 (2.1)	-	5 (5.3)	81 (86.2)	1 (1.1)	5 (5.3)	94
OPD	-	-	1 (5.3)	18 (94.7)	-	-	19

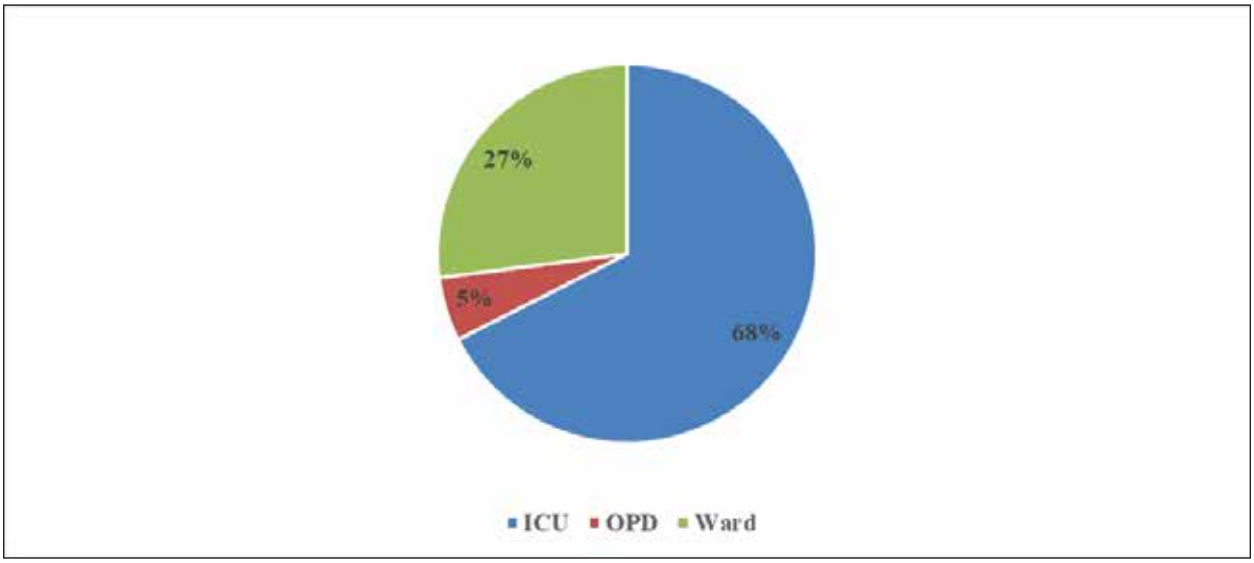


Figure 62: Distribution of reserve drug usage in different locations (n=348)

Table 20: Utilization of reserve drugs across hospital locations

Locations	Reserve Drug	Total
	n (%)	N
ICU	235 (4.7)	5,021
Ward	94 (1.4)	6,487
OPD	19 (2.9)	649

Summary of the Result:

The surveillance system includes both case-based and laboratory-based methods Due to the high number of indoor and ICU patients in case-based surveillance it showed higher resistance pattern than the lab- based surveillance. However, in overall analysis its influence is low due to its much lower (around 5%) contribution to the total number of isolates.

1. Most Frequent Organisms: *E. coli* is overall the most frequently isolated pathogen while urine samples being the most common specimen. The most frequent organisms identified from urine is *E. coli* and blood samples were *S.* Typhi (56%)
2. Antibiotic Susceptibility Patterns, trends and MDR pathogen: There is varying Susceptibility Across Settings. Susceptibility patterns of antibiotics differ significantly across outpatient departments (OPD), general wards, and intensive care units (ICU). ICU patients show the lowest susceptibility to antibiotics, while OPD patients have relatively higher susceptibility. Overall, there is low susceptibility to older drugs like Ampicillin and Cefuroxime, Ciprofloxacin. Acinetobacter, mostly isolated from ICU patient is the most resistant pathogen followed by *K. pneumoniae* and *P. aeruginosa.*
3. Higher susceptibility is observed in some organism antibiotic combination like *E.coli* and fosfomycin, nitrofurantoin in urine, *K. pneumoniae* and carbapenems and Gentamicin, *S.* Typhi and ceftriaxone, meropenem, *S. aureus* and linezolid, doxycycline. *V. cholerae* data (indoor only) indicated higher azithromycina and tetracycline susceptibility compared to other antibiotics.Imipenem and Meropenem are still effective across most gram-negative pathogens but at the cost of overuse and increasing resistance trends. Candida albicans shows high susceptibility to voriconazole (97%), C. tropicalis to Micafungin (93%). Most of the pathogen shows increasing resistance tendency from the initiation of surveillance on 2017 to 2024. Critical priority pathogens, as identified by WHO, show increasing resistance to Ceftriaxone over the period. For Enterobacterales (e.g., *E. coli, K. pneumoniae, Proteus spp.*, and *Enterobacter spp*.), resistance has risen from 59% to 79%. *Acinetobacter* spp. (Meropenem) is persistently high (~80%??). Bangladesh is witnessing an alarming rise in resistance to last-resort antibiotics, confirming an advanced AMR stage, especially in tertiary hospital ICUs. Tetracycline is among the limited antibiotics which show increasing susceptibility towards S. aureus and also some other bacteria. There is a high prevalence of Multi drug resistant pathogens (69%-90%) in five commonly isolated pathogens: *P. aeruginosa, S. aureus, E. coli, K. pneumoniae*, and *Acinetobacter* spp.and 59% MRSA

4. Hospital-wise Resistance Hotspots: High prevalence of Carbapenem Resistance Acinetobacter is found in RMCH (98%) and MMCH (95%). Carbapenem-resistant *E. coli* ranges from 5% (BITID) to 47% (DMCH) resistance. Ceftriaxone-resistant *E. coli* >90% is found both in DMCH and CMCH. 78% Cefotaxime-resistant *E. coli* is found in RMCH.

5. Antibiotic Use Pattern: Ceftriaxone is the most commonly used (28% overall) antibiotic followed by meropenem. Ceftriaxone although the topmost used drug- its susceptibility to different bacteria is poor and gradually getting poorer along with its declining use. The use of meropenem is gradually increasing It is most used in wards whereas meropenem dominates ICU use (33.9%). Cefixime is most used in OPD. According to AWaRe classification 77% antibiotics used from watch category followed by 20% from access category and 3% from reserve category where linezolid and tigecycline predominates. Linezolid is the only top listed drug which falls into reserve category.

Inferences and Key Insights:

1. High ICU burden: Resistant organisms are concentrated in ICUs, correlating with invasive care and high antibiotic exposure.

2. Ceftriaxone & Meropenem losing efficacy: Alarming trends suggest these cornerstone antibiotics are becoming less effective.

3. Widespread MDR: Especially *Acinetobacter* spp., *K. pneumoniae*, and *P. aeruginosa.*

4. *Candida* spp. emergence: Fungal pathogens are increasingly being isolated; antifungal stewardship is needed.

5. AMR is locally variable: Site-specific antibiograms are crucial for effective treatment.

SUGGESTIONS & RECOMMENDATIONS

1. Alarmingly high resistance rates in critical care (ICU), especially in *Acinetobacter* spp. and K. pneumoniae. So, the empirical treatment choices should consider unit-specific antibiograms (ICU vs. OPD).

2. National treatment guidelines should be updated based on localized and site-wise resistance data. Implement site-specific empirical therapy guidelines using local antibiograms.

3. Mandatory Infection Prevention and Control (IPC) audits and training in ICU and wards. Focused infection control programs in hospitals with high MDR rates (e.g., RMCH, MMCH)

4. Form AMR stewardship teams (microbiologist, pharmacist, clinician). Implement audit and feedback for antibiotic prescription patterns. Regulate high-end antibiotics, especially Watch and Reserve categories. Promote delayed prescribing and culture-guided treatment. Restrict carbapenems and colistin to resistant culture-proven cases only. Provide regular training for clinicians on updated empirical treatment guidelines.

5. Enhance Diagnostic Support. Expand rapid diagnostic facilities across more centers to reduce empirical therapy. Dissemination of the antibiogram mini-handbook nationwide. Improve capacity for molecular diagnostics to detect ESBL, carbapenemase, and resistance genes (e.g., blaCTX-M, mcr1 etc.).

TAKEAWAY MESSAGE

The 2024 AMR Surveillance Report from Bangladesh highlights a growing AMR crisis, particularly in hospital environments. Rising resistance to first line and even Reserve antibiotics underscores the urgency of national action.

Key Takeaways:

- ✓ ICU patients are most at risk, with the highest MDR and mortality threat.
- ✓ *Acinetobacter* spp. and *K. pneumoniae* present the greatest threat among pathogens in Bangladesh.
- ✓ Watch group antibiotics dominate usage, endangering future treatment options.
- ✓ Without rapid, site-specific interventions, the healthcare system risks losing effective antibiotics in critical care.

Bangladesh is at a tipping point in its fight against AMR.If no urgent, coordinated, and evidence-driven actions are taken:

- ✓ Common infections will become untreatable.
- ✓ ICU mortality rates will rise due to resistant sepsis.
- ✓ Healthcare costs will soar due to prolonged hospital stays and drug failures.

But with strong stewardship, data-driven policy, and institutional accountability, Bangladesh can still reverse the AMR tide and safeguard its antibiotic arsenal for the next generation.

Way forward

The effectiveness of many antibiotics is gradually decreasing, leading clinicians to rely on a limited number of drugs for initial treatment. This growing dependence is contributing to the rise of antimicrobial resistance (AMR), making even the strongest antibiotics less effective over time. To address this issue, it is essential to improve the capacity of microbiology laboratories at all levels of the healthcare system. Performing culture and sensitivity tests before prescribing antibiotics should become standard practice, helping ensure the right antibiotic is used for the right infection. It is also important to promote antibiotic stewardship by encouraging the rational and varied use of antibiotics to reduce the pressure on a few commonly used ones. Strengthening training programs, laboratory infrastructure, and public awareness efforts will support more responsible antibiotic use. Acting now is critical to preserving the effectiveness of antibiotics and protecting the health and well-being of current and future generations.

Save Antibiotics – Save Yourself.

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Photo Gallery

AMR AWWA Seminar Tangail

PREVENTING ANTIMICROBIAL RESISTANCE TOGETHER

AMR Surveillance in Rohinga Popukation (RP)

Celebration of WAAW-2023

Consultative Meeting Pprotocol Finalization

Consultative Meeting Protocol Update

Cox's Bazar Medical College

Exploratory site visit ro RMCH for HAIs Surveillance

HAIs Serveillance

Human Health Sites

Lab Based Passive AMR Surveillance

Lab Based Passive AMR Surveillance

MMCH

MMCH

Rajshahi Medical College Hospital

Sheikh Hasina Medical College Hospital Tangail

Sylhet MAG Osmani Medical College Hospital (SOMCH)

CMCH Training

Monitoring Visit

Monitoring Visit

Training

Training

Training

MMCH Training

Integrated AMR Serveillance

Integrated AMR Serveillance

Launching Workshop CMCH

নিজে জানুন, অন্যকে জানান,
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