The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
21(2): S.I (2), 133-137 2026 www.thebioscan.com

ASSESSMENT OF ANTIMICROBIAL RESISTANCE IN UROPATHOGEN ISOLATES FROM PATIENTS ADMITTED IN A TERTIARY CARE HOSPITAL

M. Sphurthy Mitra[1*], V. Samyuktha[2], K. Sai Sireesha[2], V. Archana[2], D. Leelavathi[2]

[1]Associate Professor, Department of Pharmacy Practice, Dr. K. V. Subba Reddy Institute of Pharmacy, Kurnool, India
[2]Student, Department of Pharmacy Practice, Dr. K. V. Subba Reddy Institute of Pharmacy, Kurnool, Andhra Pradesh, India

Corresponding Author
Dr. M. Sphurthy Mitra,
Associate Professor,
Department of Pharmacy Practice,
Dr. K.V. Subba Reddy Institute of Pharmacy,Kurnool, India
Email: samyukthasamyu5454@gmail.com
Phone: 8186094605

DOI: **DOI: https://doi.org/10.63001/tbs.2026.v21.i02.S.I(2).pp133-137**

KEYWORDS

Antimicrobial resistance,
Hospital pathogens,
MDR,
Tertiary care,
Susceptibility testing

Received on: /02/2026

Accepted on:11 /03/2026

Published on:10-04-2026

Abstract

Background: Antimicrobial resistance (AMR) has emerged as a significant public health challenge, particularly in hospitalized patients where multidrug-resistant pathogens complicate treatment. **Aim:** To assess the antimicrobial resistance patterns of bacterial isolates obtained from patients admitted in a tertiary care hospital. **Methods:** A prospective observational study was conducted in the Department of Microbiology at [Government general hospital, Kurnool] over a period of [6 months]. Clinical specimens (urine) were collected from admitted patients. Isolates were identified using standard microbiological methods, and antimicrobial susceptibility testing was performed by the Kirby–Bauer disc diffusion method in accordance with CLSI guidelines M02,M07,M100 and M45 documents. **Results:** Among 140 patients, females were more commonly affected (60%) with a mean age of 42.02 years. Fever was the most frequent presenting symptom. The predominant pathogen isolated was Escherichia coli (56 cases), followed by Klebsiella (53 cases). Resistance was categorized as single, dual, or multidrug resistance, with multidrug resistance being most prevalent (59.3%). **Conclusion:** The study highlights the alarming prevalence of multidrug resistance in uropathogens. Strengthening AMR surveillance, ensuring routine antimicrobial sensitivity testing, and implementing antimicrobial stewardship programs are essential to guide rational therapy and prevent further spread of resistant infections.

Introduction:

Antimicrobial resistance (AMR) is a major global public health challenge that threatens the effective management of infectious diseases. [17,18,23]The increasing prevalence of multidrug-resistant organisms (MDROs) has significantly limited therapeutic options, leading to prolonged hospital stays, increased healthcare costs, and higher mortality rates. According to global estimates, resistant bacterial infections contribute substantially to morbidity and mortality, particularly in low- and middle-income countries such as India, where antibiotic misuse and inadequate infection control practices are common[23].

Urinary tract infections (UTIs) are among the most frequent bacterial infections worldwide, affecting nearly 150 million individuals annually. Escherichia coli remains the leading causative pathogen, followed by Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus, and Enterococcus species.[1,3,9] The widespread empirical use of fluoroquinolones, β-lactams, and aminoglycosides has accelerated the emergence of resistant strains, including extended-spectrum β-lactamase (ESBL)-producing and carbapenem-resistant organisms.[6,21]. Tertiary care hospitals represent critical hotspots for AMR due to high antibiotic utilization, invasive procedures, and the presence of immunocompromised patients.[6,20] Nosocomial infections caused by resistant pathogens, such as MRSA, carbapenem-resistant Enterobacteriaceae (CRE), and vancomycin-resistant enterococci (VRE), pose significant treatment challenges.[6,21] Resistance mechanisms—including enzymatic degradation (ESBLs, carbapenemases), target site modification, efflux pumps, reduced membrane permeability, and biofilm formation—facilitate rapid dissemination of resistance genes within hospital settings.[6,21]. Continuous surveillance of antimicrobial resistance patterns in tertiary care centers is essential for guiding empirical therapy, strengthening antimicrobial stewardship programs, and informing infection control policies. [7,8,25].Local antibiogram data play a crucial role in optimizing antibiotic prescribing practices and preventing the spread of resistant pathogens. [7,9]. Therefore, this study aims to assess the prevalence and patterns of antimicrobial

resistance among bacterial isolates obtained from patients in a tertiary care hospital, with the objective of generating local evidence to support rational antibiotic use and improve patient outcomes.

Materials and Methods

Study design: This study was a prospective observational study conducted over a period of six months. Patients were enrolled based on predefined inclusion and exclusion criteria, and data were collected prospectively from both inpatients and outpatients.

Study setting: The study was carried out in the Department of Urology, Government General Hospital, Kurnool, a tertiary care teaching hospital affiliated with Kurnool Medical College. The hospital is a 1,500-bed facility that serves a large and diverse patient population from Andhra Pradesh, Telangana, and neighboring regions.

Participants:

A total of 140 patients were included in the study. Eligible participants were those aged 18 years and above with urine culture–confirmed antimicrobial resistance. Both male and female patients, including pregnant women, were enrolled. Patients younger than 18 years or those already diagnosed and treated with antibiotics prior to culture reporting were excluded.

Instruments and data collection:

Data were collected using standardized forms and annexures:

Annexure 1: Patient demographic data collection form

Annexure 2: Urine culture and antimicrobial sensitivity reports

Annexure 3: Statistical analysis (Chi-square test)

Additional data included clinical features, antibiotic use, and outcomes.

Statistical analysis:

Data were entered into Microsoft Excel and analyzed using descriptive statistics and inferential tests. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were reported for continuous variables. The Chi-square test was applied to assess associations between antimicrobial resistance patterns and demographic or clinical variables. A p-value <0.05 was considered statistically significant.

Microbiological Methods Isolation and identification by conventional culture methods (gram staining, biochemical tests),

Antimicrobial susceptibility testing according to CLSI guidelines (M02,M07,M100).[24}

Data Analysis

Data recorded in MS Excel and analyzed using [SPSS /R]. Resistance percentages calculated. MDR defined as resistance to ≥3 antimicrobial classes.

Results and Discussion

Distribution of patient based on age groups

This pie chart illustrates the age distribution of patients. The majority fall within the 20–40 years age group (45%), followed by 41–60 years (28.6%), >60 years (19.3%), and <20 years (7.1%). This indicates that most resistant infections were observed in young to middle-aged adults.

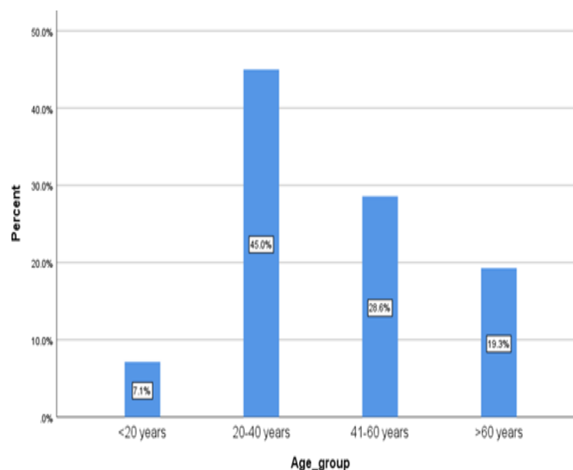


Figure 1. Distribution of patients according age wise in total study population

Age	Frequency	Percentage
<20 years	10	7.1
20-40 years	63	45
41-60 years	40	28.6
>60 years	27	19.3
Total	140	100
Mean age	42.02±17.98	

Table 1. Age distribution of patients

2. Gender wise Distribution of total study population

The gender-based chart shows that females (60%) were more frequently affected than males (40%), suggesting a possible gender-related exposure or healthcare-seeking behavior in the study setting.

Table 2 .Distribution of patients gender wise

Gender	Frequency	Percentage
Female	84	60
Male	56	40
Total	140	100

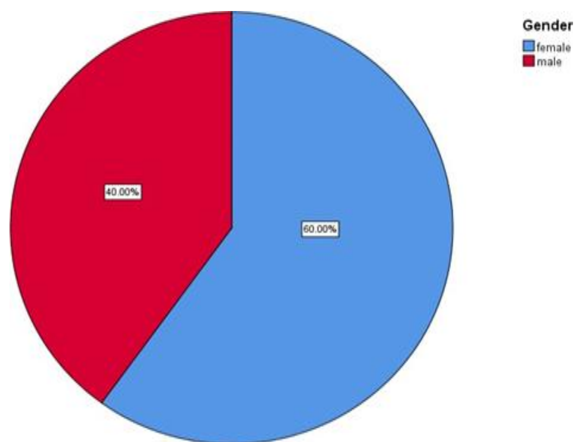


Figure 2: Distribution of study population gender wise

Symptom wise distribution

This bar graph depicts the frequency of clinical symptoms. Fever was the most common (55%), followed by urination abnormalities (39.3%) and burning micturition (32.9%). Only 10% reported per vaginal discharge, suggesting most infections involved the urinary tract

Table 3 symptom wise distribution of study population

Symptoms	Frequency (n=140)	Percentage
Burning micturition	46	32.9
Fever	77	55
Urination abnormality	55	39.3
Per vaginal discharge	14	10

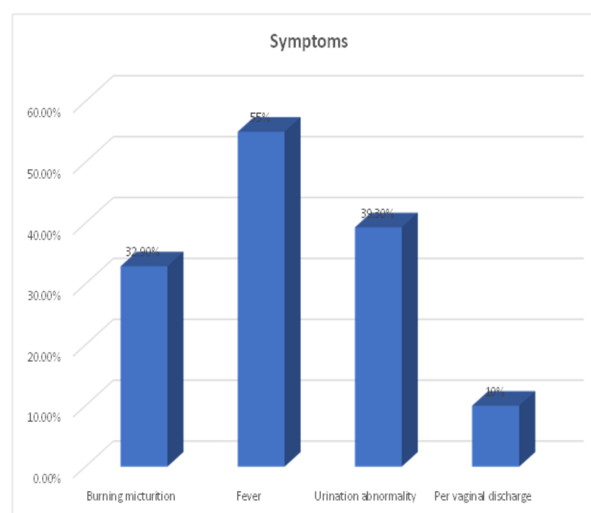


Figure 3. Distribution of study population according to symptoms

Department-wise Distribution

This chart shows patient distribution across departments. General Medicine (43.6%) and Urology (42.1%) contributed the most cases, with fewer cases from Gynaecology (10.7%) and Nephrology (3.6%), reflecting the departments most involved in treating resistant infections.

Table 4.Distribution of study population according to departments

Department	Frequency	Percentage
General Medicine	61	43.6
Gynaecology	15	10.7
Nephrology	5	3.6
Urology	59	42.1
Total	140	100

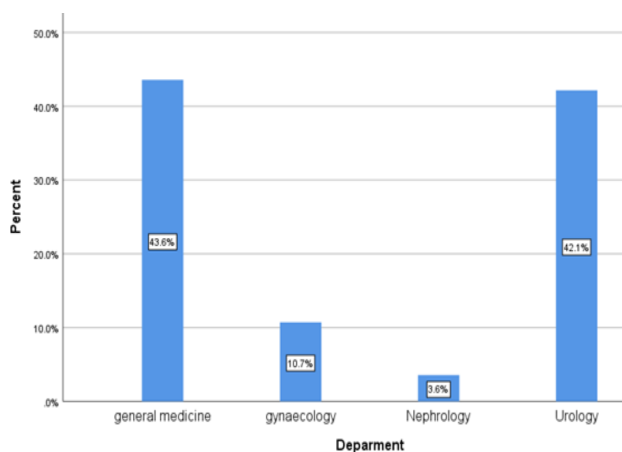


Figure 4. Distribution of study population based on departments

Isolated organism	Frequency	Percentage
Enterococci	11	7.9
Escherichia coli	56	40
Klebsiella	53	37.9
Pseudomonas Aeruginosa	13	9.3
Staphylococcus aureus	7	5
Total	140	100

Distribution of Isolated Organisms

Among isolated pathogens, E. coli (40%) and Klebsiella spp. (37.9%) were predominant, followed by Pseudomonas aeruginosa (9.3%), Enterococci (7.9%), and Staphylococcus aureus (5%). This reflects a dominance of Gram-negative organisms in resistant infections

Table .5. Distribution of study population according to isolated organisms

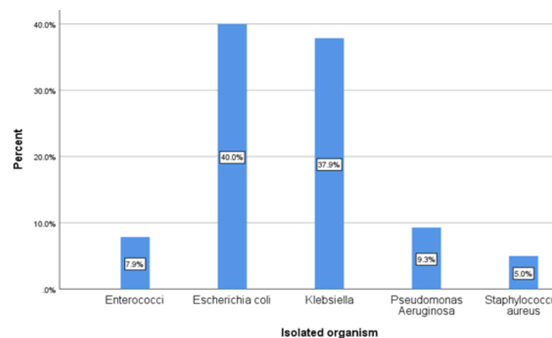


Figure 5. Distribution of study population based on isolated organisms

Types of Drug Resistance

Multidrug resistance (MDR) was seen in 59.3% of cases, dual resistance in 27.9%, and single-drug resistance in only 12.9%. This emphasizes a significant public health concern related to widespread MDR.

Table 6. Distribution of study population based on type of drug resistance

Drug resistance	Frequency	Percentage
Single	18	12.9
Dual	39	27.9
Multi	83	59.3
Total	140	100

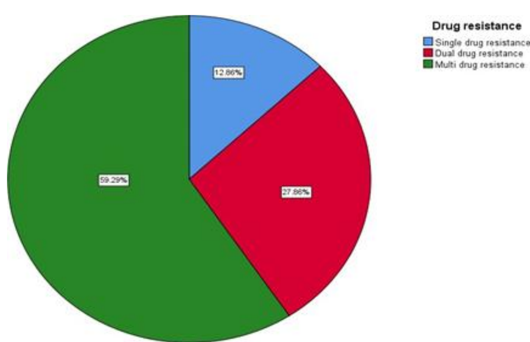


Figure 6. Distribution of study population based on type drug resistance

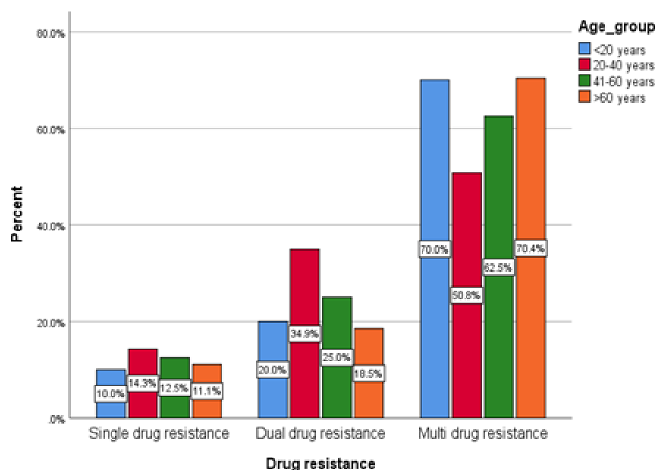
Drug Resistance by Age Group

This graph compares single, dual, and multi-drug resistance across age groups. While MDR was highest across all age groups, the 41–60 and >60 age brackets showed slightly higher MDR rates (~70%).

Table.7 comparative distribution of study population on age and type of drug resistance

Age group	Drug resistance			Total	Chi-Square P value
	Single	Dual	Multi		
<20 years	1 (10)	2 (20)	7 (70)	10	4.133 0.659
20-40 years	9 (14.3)	22 (34.9)	32 (50.8)	63	
41-60 years	5 (12.5)	10 (25)	25 (62.5)	40	
>60 years	3 (11.1)	5 (18.5)	19 (70.4)	27	
Total	18 (12.9)	39 (27.9)	83 (59.3)	140	

Figure 7. Comparative distribution of study population on age and type of drug resistance



Discussion:

Antimicrobial resistance (AMR) has become a critical global health crisis, particularly

within tertiary care hospitals where high patient turnover and advanced procedures create hotspots for multidrug-resistant organisms (MDROs). Urinary tract infections (UTIs) are increasingly difficult to manage due to the rise of resistant pathogens like E. coli and K. pneumoniae. The situation is further complicated by: Strain Evolution:

The emergence of ESBL and carbapenemase-producing strains leads to higher mortality and increased healthcare costs. Regional Factors: In developing countries like India, easy access to antibiotics and limited diagnostic infrastructure intensify the problem. Treatment Failure: Empirical therapies are increasingly failing as resistance grows against fluoroquinolones, aminoglycosides, and cephalosporins.

Study Findings and Demographics

The study analyzed 140 patients with a mean age of 42.02 years. Key demographic and clinical observations included:

Patient Profile: Females (60%) and the 20–40 age group (45%) were the most affected.

Symptoms: Fever (55%) and abnormal urination (39.3%) were the primary clinical presentations.

Departments: Most cases originated from General Medicine (43.6%) and Urology (42.1%). Pathogen and Resistance Patterns. The microbial analysis revealed a significant prevalence of resistant strains: Predominant Organisms: E. coli (40%) and Klebsiella (37.9%) were the most common isolates.

Resistance Levels: 59.3% of isolates were multidrug-resistant (MDR), while 27.9% showed dual resistance.

Commonly Resisted Drugs: Nitrofurantoin and cefixime were frequent in single resistance cases, while ampicillin and norfloxacin were common in MDR combinations.

Statistical Significance: Notably, drug resistance was not significantly associated with age, gender, or department ($p > 0.05$).

Strategic Recommendations

To curb the escalating threat of AMR, the discussion emphasizes several critical interventions:

Surveillance:

The urgent need for localized data to inform treatment guidelines and antimicrobial stewardship programs (ASPs).

Hospital Role: Tertiary center must act as sentinel sites for national surveillance and maintain strict infection

control protocols.

Management: Continuous education, rational antibiotic use, and regular monitoring are essential for effective infection management.

Conclusion

The prospective observational study conducted at Government General Hospital, Kurnool, underscores a critical and rising public health threat: the high prevalence of multidrug-resistant organisms (MDROs) within tertiary care settings. Prevalent Pathogens and Resistance Patterns: Escherichia coli was the most frequently isolated pathogen (56 cases), followed by Klebsiella (53 cases). A significant majority of these isolates (59.3%) exhibited multidrug resistance (MDR), defined by resistance to three or more antibiotic categories. Demographic Vulnerability: The burden of AMR was notably higher in female patients, who comprised 60% of the affected study population. The average age of patients experiencing resistant infections was approximately 42 years. Antibiotic Resistance Trends: Analysis of resistance profiles revealed heavy resistance to first-line agents. In single-resistance cases, Nitrofurantoin (33.3%) and Cefixime (27.8%) were most commonly involved. MDR combinations were highly complex, frequently involving ampicillin, cefixime, co-trimoxazole, and norfloxacin.

Clinical Implications:

The prevalence of MDR uropathogens restricts empirical treatment options, leading to potentially poorer patient outcomes, prolonged hospitalizations, and increased healthcare costs.

Recommendations:

Strengthen national AMR surveillance programs to monitor evolving resistance trends. Implement routine antimicrobial sensitivity testing in local laboratories to guide evidence-based prescribing. Enhance Antimicrobial Stewardship Programs (ASPs) and infection control protocols (such as hand hygiene and isolation) to contain the spread of MDROs within high-risk hospital environments.

Acknowledgments

The authors gratefully acknowledge the guidance of Dr. M. Sphurthy Mitra and Dr. K. Sitha Ramaiah, along with the support of the faculty and staff of Dr. K. V. Subba Reddy Institute of Pharmacy and Government General Hospital, Kurnool.

Funding Source

No external funding was received for this study.

Conflict of interest:

The authors declare no conflict of interest.

References

1. Stamm WE, Norrby SR. Urinary tract infections: disease panorama and challenges. J Infect Dis. 2001; 183(Suppl 1):S1-S4.
2. Gupta K, Hooton TM, Naber KG, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: a 2018 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis. 2019;68(10):e1-e10.
3. Flores-Mireles AL, Walker JN, Caparon MG, Hultgren SJ. Urinary tract infections: epidemiology, mechanisms of infection, and treatment options. Nat Rev Microbiol. 2015; 13(5): 269-284.
4. Foxman B. Urinary tract infection syndromes: occurrence, recurrence, and risk factors. Am J Public Health. 2003;93(3):376-381.
5. Tumbarello M, Trecarichi EM, Fiori B, et al. The clinical impact of multidrug-resistant uropathogens in hospitalized patients with urinary tract infection. Clin Infect Dis. 2015; 60(9): 1316-1324.
6. Holmes AH, Moore LS, Sundsfjord A, et al. Understanding the mechanisms and drivers of antimicrobial resistance. Lancet. 2016; 387(10014):176-187.
7. Alam T, Rahman S, Islam S, et al. Prevalence and antibiotic resistance of uropathogens in urinary tract infection patients: A cross-sectional study. BMC Infect Dis. 2020;20:500.
8. Akinmoladun O, Ige AO, Adewoye A, et al. Prevalence of multidrug-resistant uropathogens among hospital patients in a tertiary care center. J Infect Public Health. 2021;14(4):569-575.
9. Gupta K, Grigoryan L, Trautner BW. Antimicrobial resistance in urinary tract infections: Pathogenesis, treatment options, and clinical implications. Int J Antimicrob Agents. 2017; 50(6): 750-760.

10. Nicolle LE. Urinary tract infections in adults. BMJ Clin Evid. 2010; 2010:1802.
11. Mistry RD, Beitzel D, Anwar M, Hidayat I. Antimicrobial resistance in uropathogenic Escherichia coli and other uropathogens: Trends and treatment. J Med Microbiol. 2017; 66(5): 789-794.
12. Al-Bayssari C, Jaziri F, Hamze M, et al. Molecular characterization of multidrug- resistant Escherichia coli strains from clinical samples in Lebanon. J Infect Public Health. 2015; 8(6):470-477.
13. Micoli, F., Bagnoli, F., Rappuoli, R. et al. The role of vaccines in combatting antimicrobial resistance. Nat Rev Microbiol 19, 287–302 (2021).
14. Cave R, Cole J, Mkrtchyan HV. Surveillance and prevalence of antimicrobial resistant bacteria from public settings within urban built environments: Challenges and opportunities for hygiene and infection control. Environment international. 2021 Dec 1;157:10683.
15. Ahmad I, Malak HA, Abulreesh HH. Environmental antimicrobial resistance and its drivers: a potential threat to public health. Journal of Global Antimicrobial Resistance. 2021 Dec 1;27:101-11.
16. Tang KW, Millar BC, Moore JE. Antimicrobial resistance (AMR). British journal of biomedical science. 2023 Jun 28; 80:11387.
17. Schmiemann G, Gágyor I, Hummers-Pradier E, Bleidorn J. Resistance profiles of urinary tract infections in general practice-an observational study. BMC urology. 2012;12:1-5.
18. Marston HD, Dixon DM, Knisely JM, Palmore TN, Fauci AS. Antimicrobial resistance. Jama. 2016 Sep 20; 316(11):1193-204.
19. Smith RD, Coast J. Antimicrobial resistance: a global response. Bulletin of the World Health Organization. 2002; 80:126-33.
20. Bennani H, Mateus A, Mays N, Eastmure E, Stärk KD, Häsler B. Overview of evidence of antimicrobial use and antimicrobial resistance in the food chain. Antibiotics. 2020 Jan 28; 9(2):49
21. Thoma R, Seneghini M, Seiffert SN, Vuichard Gysin D, Scanferla G,

Haller S, Flury D, Boggian K, Kleger GR, Filipovic M, Nolte O. The challenge of preventing and containing outbreaks of multidrug-resistant organisms and Candida auris during the coronavirus disease 2019 pandemic: report of a carbapenem-resistant Acinetobacter baumannii outbreak and a systematic review of the literature. Antimicrobial Resistance & Infection Control. 2022; 211(1): 12.

22. Abushaheen MA, Fatani AJ, Alosaimi M, Mansy W, George M, Acharya S, Rathod S, Divakar DD, Jhugroo C, Vellappally S, Khan AA. Antimicrobial resistance, mechanisms and its clinical significance. Disease-a-month. 2020; 66(6):100971.
23. MT. Bacteriological Profile and Antimicrobial Resistance Patterns in Pediatric Urinary Tract Infections: A Cross-Sectional Study at Dhaka Shishu Hospital. SSB Global Journal of Medical Science. 2023;4(03):14-8.
24. World Health Organization. Antimicrobial resistance: global report on surveillance. Geneva: WHO; 2014.
25. CLSI. Performance Standards for Antimicrobial Susceptibility Testing; 32nd edition. CLSI supplement M100. Clinical and Laboratory Standards Institute; 2022.
26. Kumar S, Gupta R, Sharma A. Antimicrobial resistance patterns of Gram-negative bacilli in a tertiary care hospital. J Infect Public Health. 2021;14(5):650-656.