



Original Research Article

Bacteriological Profile of UTI and their Antimicrobial Resistance Pattern Among Adult Patients Attending at RMCH

Sharmina Aftab^{a*}, Shamima Akter Banu^b, Ahsanul Haque^c, Mousumi Mahjabin^d, Sahanaj Parvin^c, Farhana Matin Iti^c

^a Department of Microbiology,
Rajshahi Medical College, Rajshahi,
Bangladesh

^b Department of Gynae & Obs.,
Rajshahi Medical College Hospital,
Rajshahi, Bangladesh

^c Department of Microbiology,
Rajshahi Medical College, Rajshahi,
Bangladesh

^d Department of Virology, Rajshahi
Medical College, Rajshahi,
Bangladesh

Abstract: Background: Urinary tract infection (UTI) is one of the most important causes of bacterial infections across the globe. Increasing antibiotic resistance among urinary pathogens to commonly prescribed drugs has become a therapeutic challenge. Gram negative bacilli predominating the infections. Periodic evaluation of antimicrobial activity of different antibiotics is essential as the pattern of antibiotic sensitivity may vary over periods. **Objectives:** The present study was designed to find out the bacteriological profile of urinary tract infection and their antibiotic resistance pattern among adult patients. **Material and Methods:** A cross-sectional study was done in the department of Microbiology, Rajshahi Medical College from July to December 2024. Midstream urine samples were collected from clinically suspected cases of UTI among adult patients from various indoor and outdoor department attending at Rajshahi Medical College hospital. **Results:** Out of 1710 cases, 243 (14.2%) were culture positive, where female were 139(57.2%) and male were 104(42.8%). Most common isolates identified was *Escherisia coli* 140(57.6%), followed by *Klebsiella spp.* 41(16.9%), *Pseudomonas aeruginosa* 20(8.2%) and *Enterococci spp.* 27(11.1%). Gram negative organisms showed highest resistance to cefixime, ceftriaxone, cefuroxime, azithromycin and amoxiclav and highest sensitivity to colistin, nitrofurantoin and imipenem. Gram positive bacteria were highly resistant against cefixime, Cotrimoxazole, ceftriaxone, cefuroxime, azithromycin, amoxiclav and ciprofloxacin and highest sensitivity to vancomycin, linezolid, nitrofurantoin and imipenem. **Conclusion:** This study indicated that mainly gram-negative bacilli were found to be responsible for UTI and most frequent isolated bacteria was *E. coli*. and all isolates showed resistance to commonly used antimicrobial agents. As the drug-resistant pattern of the uropathogens varies according to the geographical area and time, the selection of appropriate drug for UTIs should be assured after sensitivity pattern analysis of the urinary cultures.

***Correspondence to:**

Dr. Sharmina Aftab
Email: sharminarlin@gmail.com

Article History

Received: 12.02.2025

Accepted: 18.04.2025

Published: 30.06.2025

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

Keywords: Urinary Tract Infection, Uropathogens, Gram-Negative Bacteria, Antimicrobial Resistance.

Cite this as: Aftab S, Banu SA, Haque A, Mahjabin M, Parvin S, Iti FM. Bacteriological Profile of UTI and their Antimicrobial Resistance Pattern Among Adult patients Attending at RMCH. BMCJ. 2025;11(1): 83-87

Introduction

Urinary Tract infection (UTI) is now very common disease throughout the world among the people of all ages and sex. However, UTI is the most familiar name of infection and the rate is so high among the women

in all over the world. Many researchers reported that 60% women suffer from this infection at any phase of their lifetime and 20-30% people suffer from repeated infection.¹ It is estimated that there are about 150 million urinary tract infections per annum worldwide.² It contributes as the most common

nosocomial infection in many hospitals and accounts for approximately 35% of all hospital-acquired infections.³ Among uropathogens, *E. coli* is the predominant etiological agent of UTIs. The other gram-negative pathogens causing UTIs are *Klebsiella* spp., *Proteus mirabilis* and *Pseudomonas aeruginosa*. However, Enterococci and coagulase negative Staphylococci are the gram-positive bacteria most commonly responsible for UTIs.²

In Bangladesh, use of antibiotics is rampant resulting in increase in resistance to available antibiotics. Random and extensive use of broad spectrum of antibiotics contributed to changes in the microbiological and antibiotic susceptibility patterns of pathogens isolated from UTI. Therefore, for effective management of these infections, selection of antibiotics should be based on antibiotic susceptibility pattern. But it is often hampered by the lack of adequate facilities for proper microbial isolation as well as for their antimicrobial susceptibility testing.⁴ This study is therefore undertaken to study the current scenario of UTI among adult patients in Rajshahi region. The aim of the study is bacteriological profile and antibiotic resistance pattern of bacteria causing UTI among adult patients attending in Rajshahi medical college hospital.

Material and Methods

This cross-sectional study was carried out in the Microbiology department of Rajshahi medical college over a period from July to December 2024. Patients presenting with urinary symptoms (dysuria, urgency, frequency, incontinence, hematuria and suprapubic pain) and those with fever without a focus were enrolled in the study. Wet mount microscopy of urine was done to detect pyuria, hematuria and presence of any other abnormal cells. Clean catch midstream urine samples were collected into a wide mouthed sterile container. Urine culture was done on Mac conkey agar, Blood agar, Nutrient agar and Hichrome UTI agar with a calibrated loop. A growth of greater than 30 colony forming units/ml of a single organism for midstream urine samples and greater than $>10^5$ colony forming units/ml for samples was considered significant bacteriuria and UTI. The antibiotic sensitivity test was done on Mueller-Hinton agar by Kirby-Bauer disc diffusion test.⁵

Results

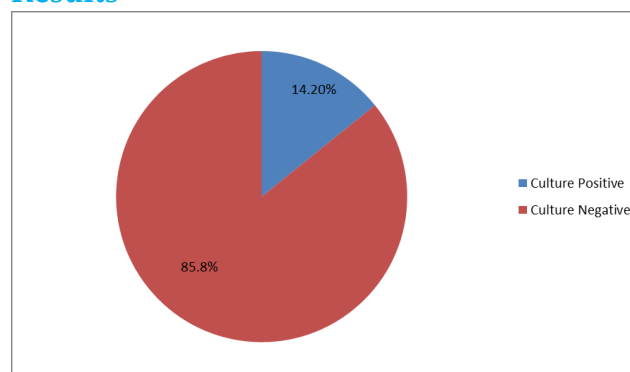


Figure 1: Frequency of Culture Positive and Negative Cases (N=1710)

Figure 1 shows culture positivity of isolated organisms. Out of 1710 samples, 243(14.2%) samples were culture positive while 1467(85.8%) samples were culture negative.

Table 1: Age and Sex Distribution of Culture Positive Cases (N=243).

Age (years)	Culture-positive cases	Male (%) (n=104)	Female (%) (n=139)
19-30	57	25(24.1)	32(23.1)
31-40	98	41(39.4)	57(41.1)
41-50	37	16(15.4)	21(15.1)
51-60	29	13(12.5)	16(11.5)
>60	22	09(8.7)	13(9.4)
Total	243	104(42.8)	139(57.2)

Accordingly, age and sex distribution of study population was shown in following Table-1. Maximum 98 culture positive cases were found within the age group of 31-40 years where male was 41(39.4%) and female were 57(41.1%). As a whole, males were 104(42.8%) and females were 139(57.2%) giving a male and female ratio 1:1.3.

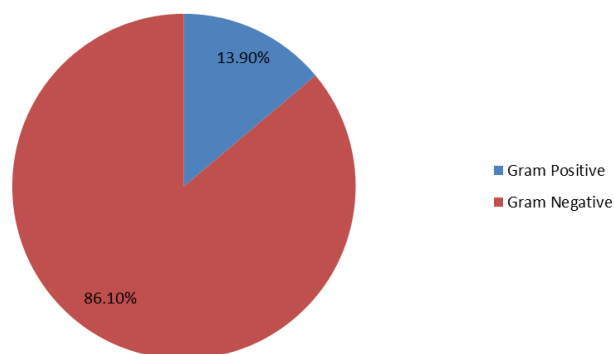


Figure 2: Frequency of Gram Positive and Gram-Negative Bacteria (N=243)

Figure 2 shows the distribution of gram-positive and gram-negative isolate among culture positive cases. Among the total 243 isolates, Gram negative bacteria were 209(86.10%) and gram-positive bacteria were 34(13.90%).

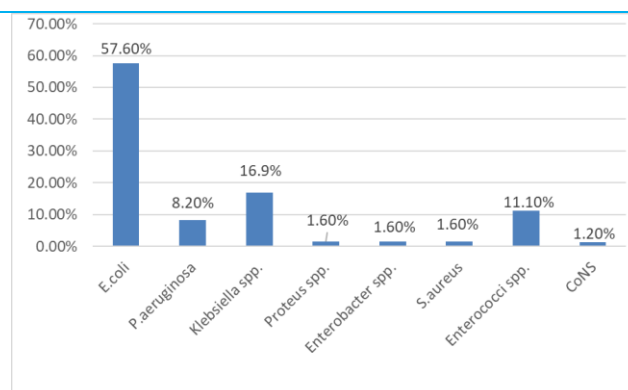


Figure 3: Bacteria Isolated from Culture Positive Cases (N=243)

Figure 3 shows the identified species of bacteria isolated from culture positive cases. Out of 1710 samples, a total of 243 bacteria were identified. E. coli was 140(57.6%) followed by Klebsiella spp. 41 (16.9%), Enterococci spp. 27(11.1%), P. aeruginosa 20(8.2%) and proteus spp. 4(1.6%).

Table 2: Antimicrobial Resistance Pattern of Gram-Negative Bacteria

Antimicrobial agents	E. coli N= (140)	Klebsiella spp. (N=41)	Pseudomonas aeruginosa (N=20)	Proteus spp. (N=04)	Enterobacter spp. (N=04)
Imipenem	10(7.1%)	12(29.4%)	06(30%)	01(25%)	01(25%)
Azithromycin	98(70%)	35(85.4%)	16(80%)	03(75%)	03(75%)
Ciprofloxacin	55(39.3%)	33(56.1%)	09(45%)	02(50%)	02(50%)
Ceftriaxone	122(87.1%)	36(87.7%)	17(85%)	03(75%)	03(75%)
Cefepime	65(46.4%)	28(68.3%)	15(75%)	03(75%)	03(75%)
Piperacillin/tazobactam	21(15%)	17(41.5%)	03(15%)	01(25%)	01(25%)
Cefixime	132(94.3%)	38(92.3%)	18(90%)	03(75%)	03(75%)
Aztreonam	36(25.6%)	26(63.4%)	10(50%)	03(75%)	02(50%)
Amikacin	46(32.4%)	22(53.6%)	09(45%)	02(50%)	02(50%)
Cefuroxime	127(90.7%)	39(95.1%)	18(90%)	04(100%)	04(100%)
Colistin	03(2.1%)	03(7.3%)	01(5%)	00	00
Levofloxacin	34(24.2%)	24(58.4%)	04(20%)	02(50%)	01(25%)
Amoxiclav	60(42.9%)	33(80.5%)	13(65%)	03(75%)	03(75%)
Nitrofurantoin	07(5%)	10(24.4%)	04(20%)	01(25%)	01(25%)

Table 2 shows the antimicrobial resistance pattern among gram negative bacteria. All the gram-negative bacteria were highly resistant against cefixime, ceftriaxone, cefuroxime, azithromycin and amoxiclav. Colistin, nitrofurantoin and imipenem were showed lower resistance against gram negative bacteria.

Table 3: Antimicrobial Resistance Pattern of Gram-Positive Bacteria.

Antimicrobial agents	Enterococci spp. (N=27)	CoNS (N=03)	S.aureus N=(04)
Imipenem	05(18.5%)	01(33.3%)	01(25%)
Azithromycin	23(85.2%)	03(100%)	03(75%)
Ciprofloxacin	19(70.4%)	02(66.7%)	02(50%)
Ceftriaxone	25(92.6%)	02(66.7%)	03(75%)
Vancomycin	02(7.4%)	00	00

Linezolid	02(7.4%)	00	00
Nitrofurantoin	04(14.8%)	00	01(25%)
Amoxiclav	15(55.6%)	02(66.7%)	03(75%)
Amikacin	11(40.7%)	01(33.3%)	02(50%)
Cefuroxime	18(94.7%)	02(66.7%)	03(75%)
Cefixime	24(88.9%)	02(66.7%)	04(100%)
Levofloxacin	09(33.3%)	01(33.3%)	01(25%)
Cotrimoxazole	17(62.9%)	02(66.7%)	03(75%)

Table 3 shows the antimicrobial resistance pattern among gram positive bacteria. Gram positive bacteria were highly resistant against cefixime, cotrimoxazole, ceftriaxone, cefuroxime, azithromycin, amoxiclav and ciprofloxacin. Vancomycin, linezolid, nitrofurantoin and imipenem were showed lower resistance against gram positive bacteria.

Discussion

Out of 1710 urine samples obtained in the Microbiology laboratory from RMCH, Rajshahi for aerobic culture and sensitivity, 14.2% yielded positive culture whereas 85.8% yielded no growth. This study was nearly similar with the study of Setu *et al.* and Garg *et al.* but dissimilar with the study of Sanjee *et al.* and Mishra *et al.*^{2, 6-8} Figure- 2 shows sex distribution of culture positive cases. Among them, 104 (42.8%) were male and 139 (57.2%) were female. Females are at increased risk due to a shorter urethra and its proximity to the anus which encourages contamination and ascent of fecal flora into the urinary tract.

This study was nearly similar with the study of Setu *et al.* and Kumar *et al.* but dissimilar with the study of Malik *et al.*^{6, 9, 10} Maximum 98 (40.2%) cases were found within the age group of 31-40 years. This study was nearly corresponding with the study of Sanjee *et al.* and Malik *et al.* This may be due to a greater involvement of this age group in sexual activity.^{2, 10} Out of a total 1710 samples, Gram negative bacteria were accounted for higher isolation rate (Gram-positive 13.9% and Gram-negative 86.1%) than gram positive bacteria. This study was nearly similar with the study of Setu *et al.* and Suman *et al.* but nearly dissimilar with the study of Sanjee *et al.* and Das *et al.*^{2, 6, 11, 12} Higher incidences of Gram-negative bacteria, in causing UTI has many factors which are responsible for their attachment to the uroepithelium. In addition, they are able to colonize in the urogenital mucosa with adhesions, pili, fimbriae and P-1 blood group phenotype receptor. Among gram negative bacteria,

E. coli were the most frequent isolates 140(57.6%). Study was similar with the study of Sanjee *et al.* and Pardeshi *et al.* but findings were dissimilar with Hossain *et al.* and Garg *et al.* *E. coli* is a common cause of UTIs in children because it resides in the digestive tract and can easily migrate to the urethra and urinary tract, where it can multiply and cause infection and also due to their developing immune systems, frequent hand-to-mouth contact, and exposure to contaminated environments.^{2, 7, 13, 14} Among gram positive bacteria, Enterococci spp. was the most common bacterial isolates 27(11.1%). This study was similar with the study of Hossain *et al.* and Chooramani *et al.* Study was dissimilar with the study of Sanjee *et al.* Sneka *et al.*^{2, 3, 14, 15}

The isolated gram-negative bacteria were highly resistant to cefixime, ceftriaxone, cefuroxime, azithromycin, amoxiclav and ciprofloxacin. Colistin, nitrofurantoin and imipenem are effective against gram negative bacteria. This study was nearly similar with Akther *et al.* and Malik *et al.*^{10, 16} The isolated gram-positive bacteria were highly resistant to cefixime, Cotrimoxazole, ceftriaxone, cefuroxime, azithromycin and amoxiclav. But relatively lower resistance was observed against vancomycin, nitrofurantoin, linezolid and imipenem. This study was nearly similar with Nahar *et al.* and Chooramani *et al.*^{3, 17} These variations may be due to differences in local conditions, prevention protocols, antibiotic policy as well as duration of study, variation in host and immune status of the host.

Declarations

I, hereby, declare that the submitted Research Paper is my original work and no part of it has been published anywhere else in the past.

Ethical approval: Ethical clearance for the study was taken from the Institutional Review Board and concerned authorities, Rajshahi Medical College & Hospital.

Funding: No funding sources.

Conflict of Interest: None declared.

Consent: Informed written consent was taken from each patient or patient's attendant.

References

1. Tabassum N, Akter A and Acharjee M. Prevalence of Urinary Tract Infection among the Patients Admitted in the Brahmanbaria Medical College

- Hospital in Bangladesh. *Merit Research Journal of Medicine and Medical Sciences*. 2020; 8(5): 111-119.
2. Sanjee S A, Karim M. E, Akter T, Parvez M. A. K, Hossain M, Jannat B, Pervin S. Prevalence and Antibigram of Bacterial Uropathogens of Urinary Tract Infections from a Tertiary Care Hospital of Bangladesh .2017; *J. Sci. Res*. 9 (3): 317-328.
3. Chooramani G, Jain B, Chauhan P.S.Prevalence and antimicrobial sensitivity pattern of bacteria causing urinary tract infection; study of a tertiary care hospital in North India *Clinical Epidemiology and Global Health*.2020; 8: 890–893.
4. Hossain G, Hossain E, Ahammed F, Mohammed R. K, Karmaker G, Iqbal A. Chowdhury M, Mursalin, Atonu Das. Bacteriological profile and sensitivity pattern of urinary tract infection patients in north east part of Bangladesh *Int J Adv Med*. 2020;7(11):1614-1618.
5. CLSI, (2017). Performance Standards for Antimicrobial Susceptibility Testing. 27th ed. CLSI supplement M100.Wayne, P.A.: Clinical and Laboratory Standards Institute.
6. Setu SK, Sattar ANI, Saleh AA, Roy CK, Ahmed M, Muhammadullah S, Kabir H. Study of Bacterial pathogens in Urinary Tract Infection and their antibiotic resistance profile in a tertiary care hospital of Bangladesh. *Bangladesh J Med Microbiol* 2016; 10 (01): 22-26.
7. Garg N, Shukla I, Rizvi M, Ahmed S .M, Khatoon A and Khan F. Microbiological Profile and Antibiotic Sensitivity Pattern of Bacterial Isolates Causing Urinary Tract Infection in Intensive Care Unit Patients in a Tertiary Care Hospital in Aligarh Region,IndianInt.J.Curr.Microbiol.App.Sci. 2015;1: 163-172
8. Mishra R, Jayesh, Singh A.K and Jasuja K. Bacteriological profile and sensitivity pattern of microorganisms causing Urinary Tract Infection at a tertiary care center in eastern Uttar Pradesh *International Journal of Biomedical and Advance Research*. 2016; 7(6): 292-297.
9. Kumar A, Kumar R, Gari M, Keshri U.P, Sumit K. Mahato, Ranjeeta K. Antimicrobial susceptibility pattern of urine culture isolates in a tertiary care hospital of Jharkhand, India *Int J Basic Clin Pharmacol*. 2017;6(7):1733-1739
10. Malik S, Rana J.S, Nehra K. Prevalence and Antibiotic Susceptibility Pattern of Uropathogenic Escherichia Coli Strains in Sonapat Region of Haryana in India *Biomed Biotechnol Res J*. 2021;5:80-7.
11. Suman U, Lal R, Chaudhary M & Baveja C.P. Bacteriological Profile and Antibigram of Urinary Tract Infection in a Tertiary Care Hospital at Central Delhi: A Retrospective Analysis. *International Journal of Current Medical And Applied Sciences*. 2022; 34(2): 77-81.
12. Das UK, Bhattacharjee P, Debnath S, Chakraborty M, Ghosh R, Das L, Chakraborty D. Antibiotic sensitivity pattern of bacterial isolates from urine samples of admitted patients with urinary tract infection in a tertiary care teaching hospital of Tripura, India: a hospital record-based study *Int J Basic Clin Pharmacol*. 2018;7(4):585-589
13. Pardeshi P. Prevalence of urinary tract infections and current scenario of antibiotic susceptibility pattern of bacteria causing UTI *Indian Journal of Microbiology Research*. 2018;5(3):334-338
14. Hossain I, Bhowmik S, Uddin M.S, Devnath P, Akter A, Eti L.N, Hussien S, Nayem M.R, Rahman S, S. M. Sayem and Islam M.T. Prevalence of urinary tract infections, associated risk factors, and antibiotic resistance pattern of uropathogens in young women at Noakhali, Bangladesh. *Asian J. Med. Biol. Res*. 2021, 7 (2): 202-213
15. Sneha P., Mangayarkarasi. Bacterial pathogens causing UTI and their antibiotic sensitivity pattern: a study from a tertiary care hospital from South India *V.Trop J Path Micro* 2019;5(6):379-385.
16. Akther N, Farjana A. Hira, Khatun A., Shawan M, Shaike M. Abdullah, Esrat J. Shorna, Islam A, Islam K, Nazmul M, Hossain. Antibiotic resistance pattern in the bacterial strains of urinary tract infection in Tangail city, Bangladesh. *J Adv Biotechnol Exp Ther*. 2023; 6(2): 419-428.
17. Nahar A, Hasnat S, Akhter H, Begum N. Evaluation of antimicrobial resistance pattern of uropathogens in a tertiary care hospital in Dhaka city, Bangladesh *South East Asia Journal of Public Health*. 2017;7(2):12-18.