Journal of Advances in Microbiology Research

E-ISSN: 2709-944X
P-ISSN: 2709-9431
JRM 2025; 6(1): 133-137

www.microbiojournal.com
Received: 14-02-2025
Accepted: 16-03-2025

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# Periodic monitoring of etiological agents of UTI and their resistant pattern against broad spectrum antibiotics in tertiary care Hospital

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**DOI:** https://www.doi.org/10.22271/micro.2025.v6.i1b.207

**Abstract**
**Aim:** To identify most common microorganisms causing UTI and the percentages of all highly resistance antibiotics.
**Objectives**
1. To find out the most common resistant groups of antibiotics.
2. To find out the most common microorganisms causing UTI.

In current scenario what kind of antibiotics are working in UTI patient in tertiary care hospital.
**Introduction:** Urinary tract infection is a very common infection in both gender male and female, it is very common in clinical practices also. It is a known health problem among the community not only in India but across the world, the data shows that in all kind of health care issues UTI is a very common problem, in hospitals, patients who have indwell catheter they may get CAUTI (Catheter associated urinary tract infection) it is also very big issue because where patients are getting their treatment at the time of their hospital stay, they have got another infection of Urinary tract. It has been found that the *E.coli* and *Klebsiella spp.* and many other gram negative bacteria are the commonest cause of UTI.
**Materials and Methods:** A Cross-sectional observational study was conducted over a period of One year- in July 2022 to July 2023 in tertiary care hospital among OPD and IPD patients under multi-specialty service of the Hospital.
**Results:** The most commonest etiological agent found was *Klebsiella spp.* rest of it, other microorganisms were *Escherichia coli, Enterococcus, candida albicanc, Pseudomonas aeruginosa, Pseudomonas fluorescens and Proteus spp.* The number of Urinary tract infected were only 30 out of 100 patients in which we isolated many bacterial spp. They have been infected IPD and OPD patients. The most common pathogens being *Klebsiella spp*. (56.6%) who have been infected 17 cases, *E.coli spp*. infected 3 cases (9.6%), *Pseudomonas spp*. Infected 2 cases (6.45%) *Candida spp. infected 2 cases* (13.3%), *Enterococcus spp*. Infected 2 cases (6.45%) and *Proteus spp. infected 2 cases* (6.6%).
**Conclusion:** This periodic research shows that now a days most of the antibiotics are getting resistant there we can understand through the group of antibiotics like, cephalosporin are getting resistant more than 80% (Cefazolin, Cefixime, Cefotaxime, cefepime and ceftriaxone), Amoxicillin belongs to a group of drugs known as penicillin-like antibiotics and it functions by preventing bacterial growth. Clavulanic acid belongs to a group of drugs known as beta-lactamase inhibitors. It functions by stopping bacteria from breaking down amoxicillin they are also showing 86% of resistance which is (26 times found resistant out of 30 positive cases).

**Keywords:** Urinary tract infection, urethra, *Escherichia Coli* spp.

## Introduction
UTI is come now at first in all kind of infection whether it is a community or a medical practice place; it is very common in all age groups of peoples.
One of the most common types of infectious diseases is urinary tract infections (UTIs), being responsible for about 150-250 million cases per year, worldwide
(A.L. Flores-Mireles *et al*., 2015 and Hrbacek *et al*., 2020) [1, 2].
UTI may occur through many reasons like unhygienic toilets, low water intake, sexual contacts and in children's UTI occur through nappy and continuous use of diaper (Choubey S, Verma M. 2022) [18] it may also occur through, Foley's catheter in patients who have indwell Foley's for urination, in this condition patient may feel micturition, burning sensation and pain in urination, which are the common symptoms of UTI, this condition is called CAUTI in which a bacteria can enter in to the urinary system and cause infection, there are many gram negative bacteria which cause UTI, but for hospital admitted patients some other kind of bacteria may also cause UTI like *Enterococcus spp., Enterobacter spp*.

and *Acinetobacter baumannii* and *staphylococcus spp.*
The common bacteria which causes UTI are *E.coli*. spp, *Klebsiella spp, Pseudomonas* spp. and *Proteus spp.* for all mankind.
The bacteria *Escherichia coli* was discovered by German pediatrician the odor *Escherich* (1857-1911), who isolated it from babies' feces in 1885 (Feng P *et al*., 2017) [3].
*E. coli* is a gram-negative, non-sporulating, rod-shaped, facultative anaerobic, and coliform bacterium pertaining to the genus *Escherichia* that commonly inhabits the environment, foods, and warm-blooded animals' lower gut,*Proteus* also found in multiple environmental habitats, including long-term care facilities and hospitals. In hospital setting, it is not unusual for *proteus* species to colonize both the skin and mucosa of hospitalized patient and causing opportunistic nosocomial infections. It is one of the common causes of UTI in
hospitalized patients undergoing urinary catheterization (Chow AW and Wang JT, *et al.,* 2014) [8, 9].
Urinary catheters are standard medical devices utilized in both hospital and nursing home settings are associated with a high frequency of catheter-associated urinary tract infections (CAUTI). The contribution of *Klebsiella* spp. in CAUTI is near about 7.7% 4 7 (Gould C *et al*., 2009) [10].

**Mixed bacterial growth in Catheterized Patients**
Catheter Associated Asymptomatic Bacteriuria (CA-ASB) is diagnosed when one or more organisms are present at quantitative counts $\geq 10^5$ cfu/mL from an appropriately collected urine specimen in a patient with no symptoms (RP, Maki DG 1984) [4] Lower quantitative counts may be isolated from urine specimens prior to $\geq 10^5$ cfu/mL being present, but these lower counts likely reflect the presence of organisms in biofilm forming along the catheter, rather than bladder bacteriuria (Nicolle LE 2005) [5].
Thus, it is recommended that the catheter be removed and a new catheter inserted, with specimen collection from the freshly placed catheter, before antimicrobial therapy is initiated for symptomatic infection symptoms (RP, Maki DG 1984) [4]. In biofilm culture, most biofilm contains mixed bacterial communities meaning polymicrobial colonization.
Pseudomonas is third ranking causes nosocomial UTI about 12%, where *E. coli* remain on the top (Warren JW 2001) [6].
CAUTI is directly associated with duration of catheterization. Within 2-4 days of catheterization 15-25% patients develop bacteriuria (Costerton JW and Anwar H 1994) [7].
Proteus species, member of the Enterobacteriaceae family of gram-negative bacilli are distinguishable from most other genera by their ability to swarm across an agar surface (Penner JL *et al.*, 1984 and Penner JL *et al*., 1980) [11, 12].
Proteus species are most widely distributed in environment and as other enterobacteriaceae, this bacterium is part of intestinal flora of human being Proteus also found in multiple environmental habitats, including long-term care facilities and hospitals. In hospital setting, it is not unusual for proteus species to colonize both the skin and mucosa of hospitalized patient and causing opportunistic nosocomial infections. It is one of the common causes of UTI in hospitalized patients undergoing urinary catheterization (Chow AW *et al*.,1979 *and* Wang JT *et al*.,2014) [8, 9].

**Purpose of this study:** To identify the etiological agent of the UTI and its most common resistant antibiotics against the broad spectrum.
This study is conducted in the month of July 2022 to July 2023.
In which 100 urine samples of IPD and OPD were collected to trace the causative agent and its most resistant antibiotics.

**Methods**
Methods: A Cross-sectional observational study was conducted over a period of One year- in July 2022 to July 2023 in tertiary care hospital among OPD and IPD patients under multi-specialty service of the Hospital.
Microbiological analysis of the urine samples was done, including culture of urine samples and, identification of Microorganisms, with their antibiotic susceptibility testing.
A total of 100 patients were included in the study. The mean age of the patients was 50 years, 53% of the patients were male and 47% were Female.

**Sample collection**
Patient data collected from the patients IPD and OPD included in the study using a preformed structured questionnaire. Details such as name, age, sex, address, IP no., date of admission, clinical data of patients like presenting complaints, personal history, past medical history, high risk factors like immunocompromised status i.e. there long stay and taking of higher end of Antibiotics, physical examination findings and details of clinical diagnosis were collected. Indication for Foley's catheter was noted.
Routine examination of the patients was done to look for any evidence of urinary tract infection such as fever, change in urine colour, suprapubic tenderness and for OPD patients sample collection done on their past history of urine infection and with present complaints.
Most urine specimens are obtained from IPD patients via the clean-catch midstream technique. This technique is easy and comfortable for patients it is simple and inexpensive, it can be performed in almost any clinical setting, there is no risk of introducing bacteria into the bladder by catheterization, and there is no risk of complications.

**Male and Female Ratio**

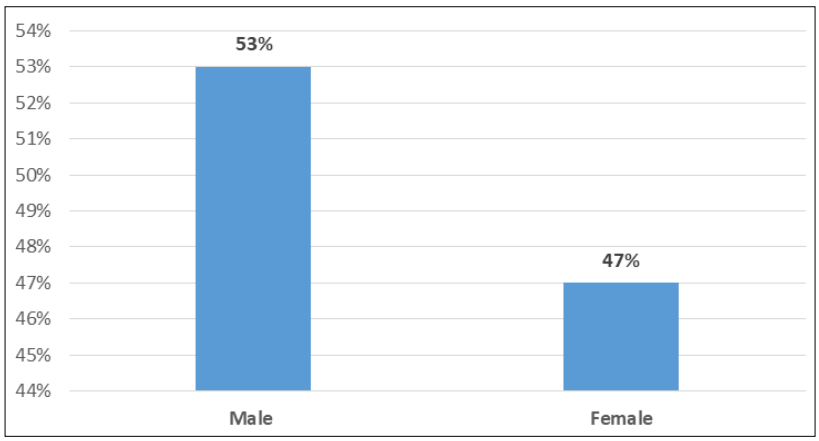


**Fig 1:** Male and Female Ratio

## Results

The most commonest etiological agent found was *Klebsiella spp.* rest of it, other microorganisms were *Escherichia coli, Enterococcus, candida albicanc, Pseudomonas aeruginosa, Pseudomonas fluorescens and Proteus spp.* The number of Urinary tract infected were only 30 out of 100 patients in which we isolated many bacterial spp. They have been infected IPD and OPD patients, its below here with their percentage.

The most common pathogens being *Klebsiella spp*. (56.6%) who have been infected 17 cases, *E.coli spp*. infected 3 cases (9.6%), *Pseudomonas spp*. Infected 2 cases (6.45%)*Candida spp infected 2 cases* (13.3%), *Enterococcus spp*. Infected 2 cases (6.45%) and *Proteus spp infected 2 cases* (6.6%).

This table shows the number of isolated bacteria with their percentage out of 30 cases.

**Table 1:** Distribution of Isolated Microorganisms from UTI Cases

| Bacteria | Frequency | Percentage |
|---|---|---|
| *Klebsiella spp. (Klebsiella oxytoca, Klebsiella Pneumonia)* | 17 | 56.6% |
| *Escherichia coli* | 3 | 9.6% |
| *Enterococcus* | 2 | 6.45% |
| *candida albicanc* | 4 | 13.3% |
| *Pseudomonas aeruginosa Pseudomonas fluorescens* | 2 | 6.45% |
| *Proteus spp.* | 2 | 6.6% |

**Table 2:** Antibiotic Resistance Pattern of Isolated Pathogens

| S. No. | Name of antibiotics | Frequency of resistant | Percentage of resistance |
|---|---|---|---|
| 1. | Amikacin | 19 | 63% |
| 2. | Amoxicillin/Clavulanic Acid | 26 | 86% |
| 3. | Ampicillin/Sulbactum | 27 | 90% |
| 4. | Azithromycin | 24 | 80% |
| 5. | Aztreonam | 26 | 86% |
| 6. | Ciprofloxacin | 26 | 86% |
| 7. | Cefazolin | 29 | 96.6% |
| 8. | Cefixime | 24 | 80% |
| 9. | Clindamycin | 28 | 93.3% |
| 10. | Cefuroxime | 28 | 93.3% |
| 11. | Clarithromycin | 28 | 93.3% |
| 12. | Cefepime | 26 | 86% |
| 13. | Cefepime/Tazobactam | 24 | 80% |
| 14. | Cefoperazone/Sulbactam | 27 | 90% |
| 15. | Ceftriaxone | 26 | 86% |
| 16. | Doxycycline | 13 | 43% |
| 17. | Doripenem | 16 | 53% |
| 18. | Ertapenem | 24 | 80% |
| 19. | Faropenem | 25 | 83% |
| 20. | Gentamycin | 22 | 73% |
| 21 | Imipenem | 23 | 76% |
| 22 | Imepenem/Cillastin | 22 | 73% |
| 23 | Linezolid | 22 | 73% |
| 24. | Levofloxacin | 24 | 80% |
| 25 | Moxifloxacin | 22 | 73% |

| | | | |
|---|---|---|---|
| 26 | Meropenem | 23 | 76% |
| 27. | Norfloxacin | 27 | 90% |
| 28. | Nitrofurontoin | 19 | 63% |
| 29. | Ofloxacin | 24 | 80% |
| 30. | Piperacillin/Tazobactum | 24 | 80% |
| 31. | Tetracyclin | 20 | 66% |
| 32. | Tigecycline | 06 | 20% |
| 33. | Ticarcyclin/Clavulanicacide | 25 | 83% |
| 34. | Vancomycin | 18 | 60% |
| 35 | Teicoplanin | 23 | 76% |
| 36. | Colistin | 20 | 66% |

Percentage of Resistance Antibiotics

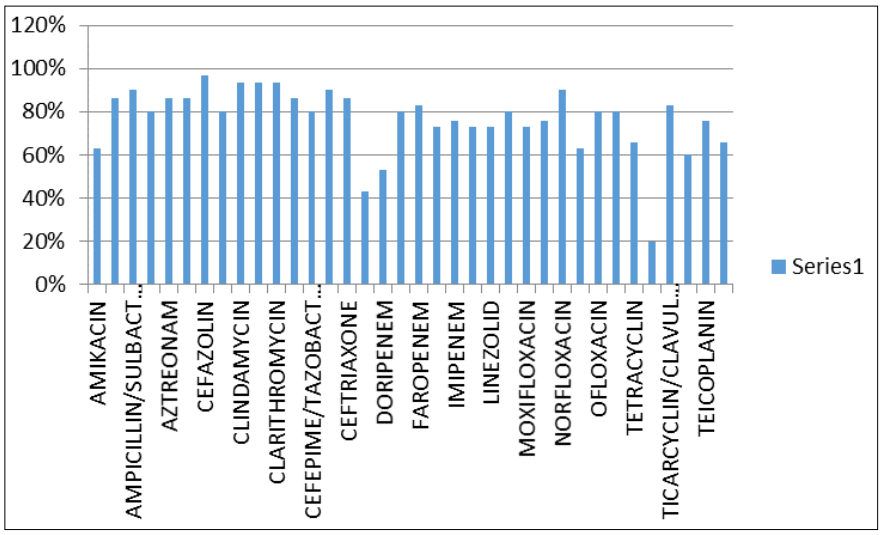


**Fig 2:** Graph of antibiotic Resistant with their percentage

## Conclusion

This periodic research shows that now a days most of the antibiotics are getting resistant there we can understand through the group of antibiotics like, the above graph shows that group of cephalosporin are getting resistant more than 80% (Cefazolin, Cefixime, Cefotaxime, cefepime and ceftriaxone), Amoxicillin belongs to a group of drugs known as penicillin-like antibiotics and it functions by preventing bacterial growth. Clavulanic acid belongs to a group of drugs known as beta-lactamase inhibitors. It functions by stopping bacteria from breaking down amoxicillin they are also showing 86% which is (26 times found resistant out of 30 positive cases), clindamycin which was the first choice of physician are getting more resistance (93%) due to the worst use in every case without performing culture and sensitivity tests, group of Carbapenems are 70% of resistance in this graph due to the same.

Antibiotics which are showing less percentage of resistance in this graph they are restricted antibiotics so the percentage of resistance are less and according CLSI use with out culture and sensitivity test it means they are near to highly resistance if our health care industry will not aware to stop the over use and misuse of antibiotics without culture and sensitivity report, now it is the responsibility to all the health care providers to set there all ethics towards the use of Antibiotics and to make their antibiotics stewardship program and periodically antibiogram according their own culture and sensitivity report.

## Acknowledgment

I am rally very much thankful to almighty who gave me wisdom to write this paper and then to my supervisor Dr. Shadma maam, and my dear friend Dr. Sonam Pandey,and of course my loving parents, dear husband and kids they are the inspiration of my writing.

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**How to Cite This Article**
Choubey S, Siddiqui S. Periodic monitoring of etiological agents of UTI and their resistant pattern against broad spectrum antibiotics in tertiary care Hospital. Journal of Advances in Microbiology Research. 2025;6(1):133-137.