

Prevalence of Microorganisms in UTI and Antibiotic Sensitivity Pattern among Gram Negative Isolates: A Cohort Study

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Abstract:- Urinary tract infections (UTI) are the second most important infections followed by Respiratory tract infections. It is also important to observe the prevalence of organisms for the appropriate use of antibiotics. The study identifies *Pseudomonas species* and *E.coli* as the most predominant organisms among 180 samples. The sensitivity pattern was observed according to CLSI guidelines 2021 and most of them beta-lactam inhibitors. It is also observed that 100% of the isolates were sensitive to carbapenem and uriedopencillin group of drugs.

Keywords:- UTI, Antibiotic Sensitive, Antibiotic Resistance

I. INTRODUCTION

Urinary tract infection (UTI) is one of the most common health problems faced among many community settings. It also accounts for a significant morbidity and mortality. According to the National Ambulatory Medical care survey, about 7 million patients visits outpatient department (OPD), in addition to about 1 million cases visits for emergency and nearly 10,000 hospitalizations from due to UTI (1). Among all cases, 50-60% of women suffers at least once in their life time. It is also estimated that 3-5% of girl children and 1% of boys were affected in paediatric population that represents the antibiotic exposure (2). It is also the worrisome attribute the early exposure in acute infections creates the antibiotic resistance. The rapid emergence of antimicrobial resistance (AMR) has been the major problem in UTI patients.

The resistance may be by intrinsic or genetic alteration, these AMR in patients may cause burden for patients economically, as it may cause prolonged hospital stay (3). The UTI may be characterized by the presence of different pathogens such as *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumonia*, *Staphylococcus saprophyticus*, and *Enterococcus faecalis* and by different location of infection, the infection occurred only at upper urinary tract is known as pyelonephritis and at lower urinary tract is known as cystitis (4).

In treating UTIs and pyelonephritis, various agents were recommended such as nitrofurantoin, trimethoprim-sulfamethoxazole, fosfomycin, fluoroquinolones, and beta-lactams. However, the widespread use of antibiotics could develop multi-drug and pan-drug resistance may lead to cause increased mortality (5). Therefore, it is necessary to monitor and manage the prevalence of antimicrobial resistant pathogens.

II. MATERIALS AND METHODS

A total of 180 urine samples were received at Rao's pathlab for the period of one month Jan 2024, all the samples were streaked on to the Mac Conkey agar, and incubated at 37°C for 16 – 18 hours. The growth was observed on the next day, the colonies were identified primarily by gram's stain followed by biochemical parameters such as indole, citrate utilization, triple sugar iron agar test and mannitol motility medium test.

The identified organisms were classified into gram-positive and gram-negative organisms, then the antibiotic susceptibility test using Kirby-Bauer disc diffusion method, according to the CLSI guidelines 2021.

A. Antibiotic Susceptibility Testing

The isolated organisms were inoculated in peptone broth to reach the turbidity of 0.5 Mc farland standard, then the organisms were swabbed onto MHA plate using sterile swabs and discs were placed aseptically and incubated. The zone diameter was measured on next day.

III. RESULTS AND DISCUSSION

Out of 180 urine samples, 72 were from Male and 108 were from female patients, 75 were no growth, and out of 105, 82 samples were gram negative bacilli, and 23 were gram positive cocci. The isolated species were shown in the chart 1.

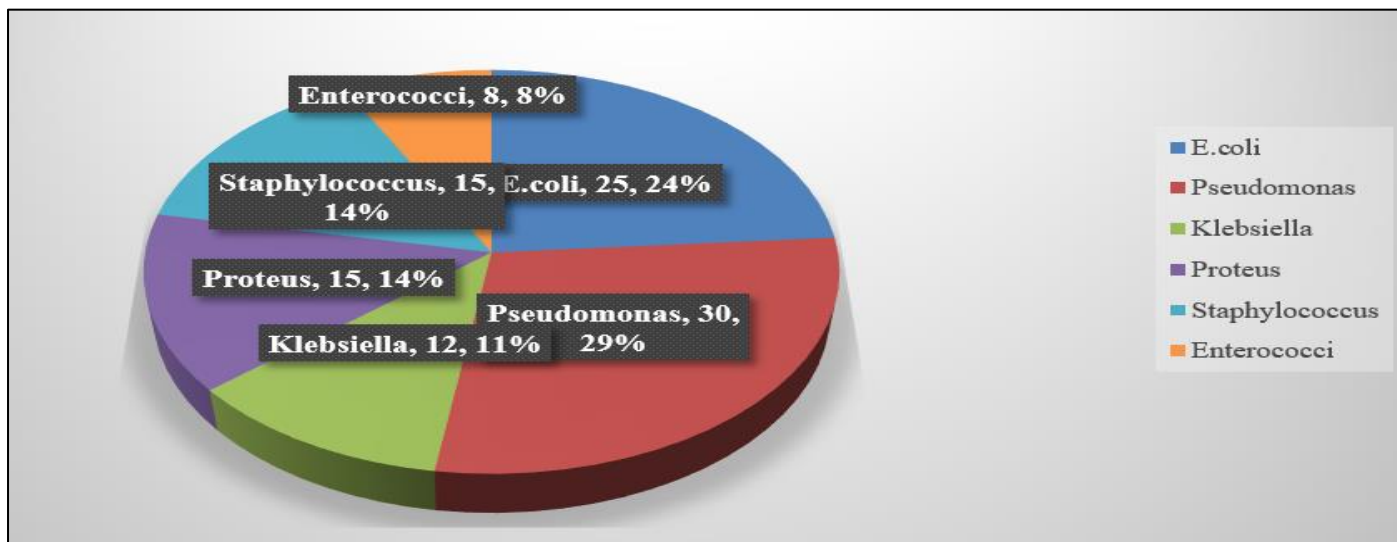


Chart 1: Distribution of Microorganisms in Urine Sample

The overall prevalence of urinary pathogens in the present study were 30 (29%) isolates of *Pseudomonas species*, 25 (24%) of *E.coli*, 15 (14%) isolates each of *Proteus species* and *Staphylococcus species*, 12 (11%) isolates of *Klebsiella* and 8 (8%) isolates of *Enterococci*. Thappa et al., 2023 encountered *E.coli* about 50% followed by *Pseudomonas species* 15%. Das and Banerjee, 2015 from Varanasi had reported that *E.fecalis* and *E.coli* were the most common organisms were isolated, whereas the present study reported that *Pseudomonas* were the most predominant isolate followed by *E.coli* and *Enterococci* were the least isolated species among all the urine samples. Faruk et al., 2023 from Bangladesh had reported that *E.coli* (50%) was the predominant isolate followed *Klebsiella species* (12%) and *Pseudomonas species* (10%) in urine samples collected at tertiary care hospital from 2016 to 2017.

The AST pattern was done by Kirby-Bauer disc diffusion method, the study concentrates only on Gram negative organisms. The gram negative isolates were *Pseudomonas species*, *E.coli*, *Klebsiella species* and *Proteus species*. In *Pseudomonas species*, out of 30 isolates, all isolates were resistant to Piperacillin and only 7% of them were sensitive to ampicillin, 100% of the isolates were sensitive to beta-lactam inhibitor drugs such as Piperacillin-tazobactam, Ampicillin-sulbactam and amoxicillin-clavulanate, the isolates were also showed 100% sensitive to Polymyxin B and Colistin. About 90% of the isolates were sensitive to Amikacin and imipenem. whereas, only 17% of the isolates were sensitive to cefuroxime, 33% of isolates were sensitive to ceftazidime, cefaperazone and oxacillin. Similar to the present study, Choudhary et al., 2013 reported that the highest percentage of resistance was noted in uriedopenicillins and lowest resistance rate was observed in carbapenems.

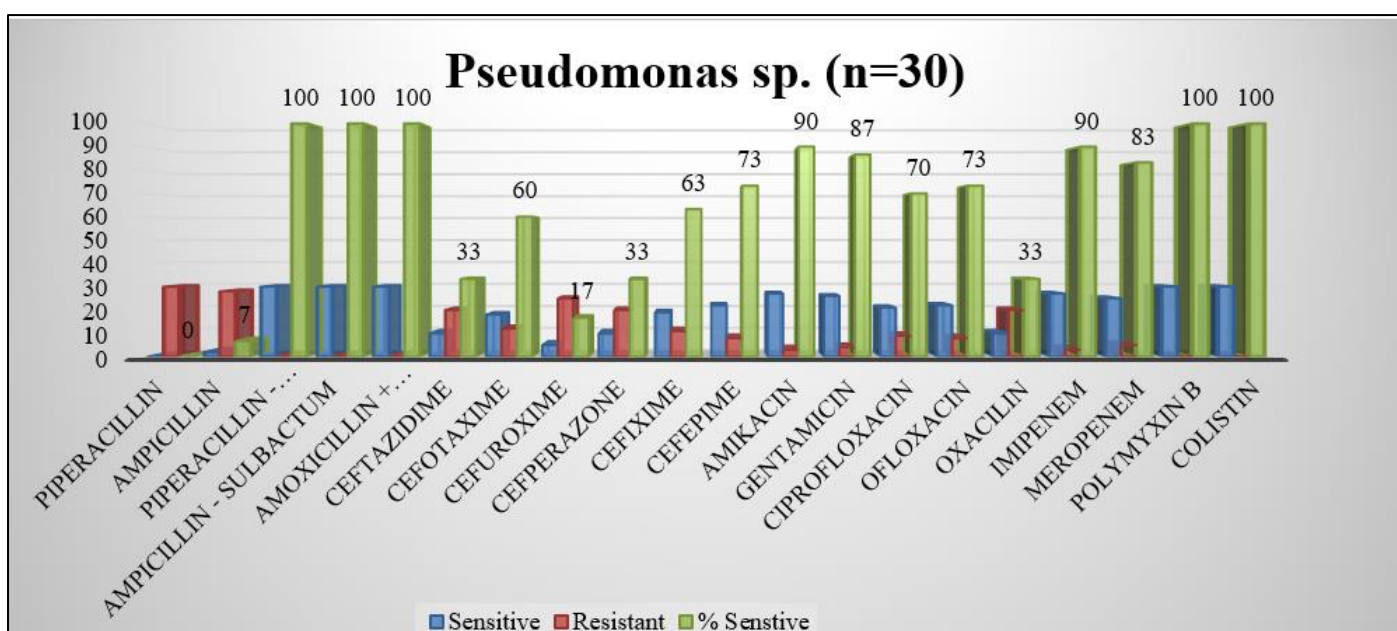


Chart 2: Sensitivity Pattern of *Pseudomonas Species*

In *E.coli*, Ayatollahi et al., 2013 from Iran had reported that Ciprofloxacin is most sensitive antibiotics and 78% of isolates were susceptible to aminoglycosides, high rates of resistance was seen in cefexime and Co-trimoxazole. Whereas in the present study, 60% of the isolates were

sensitive to ciprofloxacin and 100% of antibiotics were susceptible to polymyxin B and Colistin. None of the isolates were sensitive to uriedopenecillins and only 8% of isolates were sensitive to cefuroxime.

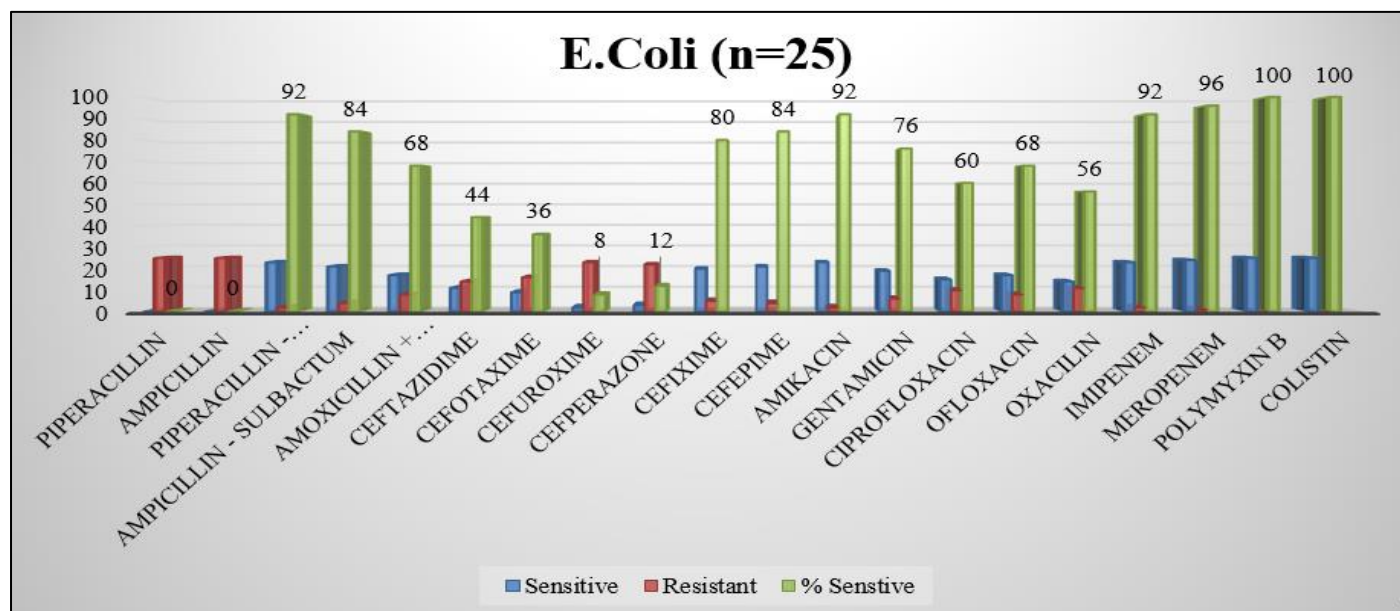


Chart 3: Sensitivity Pattern of *E.coli*

In India, Malik et al., 2021 studied the multi drug resistant pattern among the isolates of *E.coli* in UTI. They reported that 83% of isolates were exhibited multi-drug resistant pattern and 100% of isolates were sensitive to tigecycline, more than 90% isolates were sensitive to colistin and amikacin.

Similar to *E.coli* and *Pseudomonas species*, *Klebshiella species* also showed 100% sensitive to carbapenems, polymyxin B and colistin. None of the isolates were sensitive

to piperacillin, ampicillin, and cefuroxime. More than 90% of the isolates were sensitive to beta-lactum inhibitor drugs. Gautam et al., 2024 from India had reported that *Klebsiella species* had the highest resistance rate among all Enterobacteriaceae especially higher resistance rate than *E.coli*. They also reported that 100% of isolates showed sensitive to colistin, similarly the present study also showed 100% of the isolates were found to be sensitive to carbapenems, polymyxin B and Colistin.

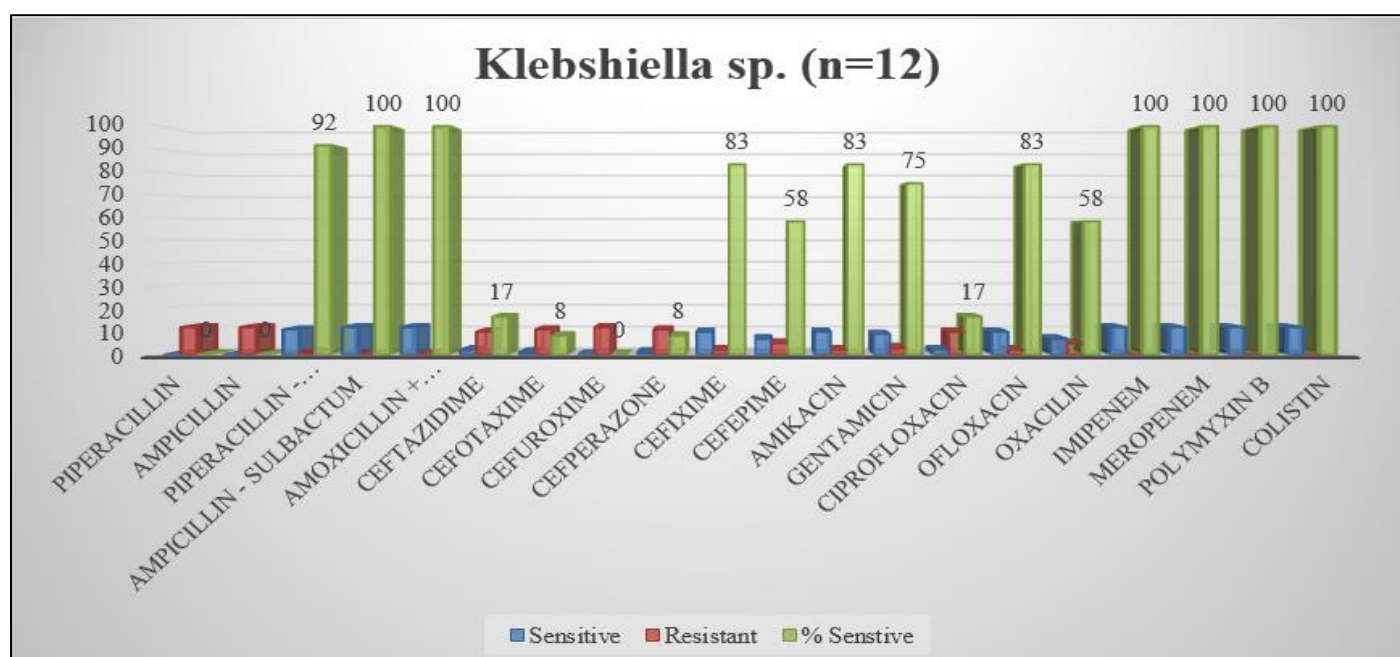


Chart 4: Sensitivity Pattern of *Klebshiella Species*

In *Proteus* species, similar to *Klebsiella* and *Pseudomonas* species, the carbapenems, aminoglycosides and beta-lactum inhibitors showed 100% sensitive, whereas

ceftazidime and cefixime showed only 33% and none of the isolates were sensitive to piperacillin and ampicillin.

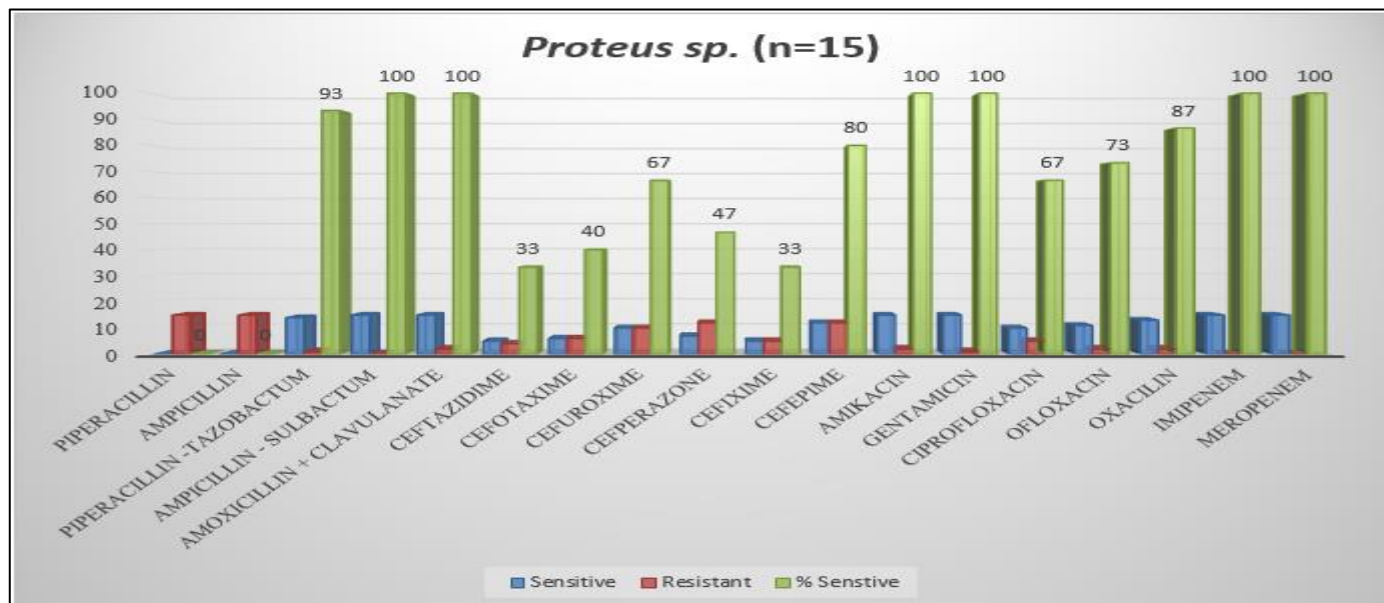


Chart 5: Sensitivity Pattern of *Proteus* Species

Similar to *Pseudomonas* species and *Klebsiella* species, *Proteus* also showed 100% sensitive towards Amikacin, Gentamicin, imipenem and meropenem. More than 90% of sensitivity to Beta-lactum inhibitors drugs. None of the isolates were sensitive to Piperacillin and Ampicillin.

IV. CONCLUSION

The study showed the prevalence and occurrence of microorganisms in UTI, and its resistance pattern. Most of the studies reported that *E.coli* as the predominant microorganism, surprisingly, the present study reported the *Pseudomonas* as the predominant organisms. The study also reveals that most of the gram negative isolates were sensitive to beta-lactum inhibitor drugs and carbapenems.

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