INSIGHTS INTO RESISTANCE AND SENSITIVITY PATTERNS OF VARIOUS UROPATHOGENS AND THEIR MANAGEMENT IN URINARY TRACT INFECTIONS

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ABSTRACT

AIM AND OBJECTIVE: The aim of the study was to Insights into resistance and sensitivity patterns of various uropathogens and their management in urinary tract infections RESULTS: The study included 221 UTI patients reports revealed that males accounted for 50.2% and females 49.7%, respectively. Escherichia coli (31.2%) was the most common and Proteus mirabilis (1.35%) was the least often found organism to cause UTIs, with the addition of klebsiella pneumonia (24.8%), and pseudomonas aeruginosa (12.2%) playing their role in causing UTIs. The gram-negative uropathogens accounted for 78.2% which caused more UTIs, followed by Gram-positive bacteria at 18.55% and fungi at 3.16%. Tigecycline (76.9%) was shown to be the most sensitive antibiotic, were as ciprofloxacin (72.3%) was the most frequently seen drug that showed resistance to uropathogens. E. coli was found to be resistant to ciprofloxacin (72.4%), but sensitive to tigecycline (95.6%). Pseudomonas aeruginosa was found to be resistant to trimethoprim/sulfamethoxazole (86.6%, but sensitive to Colistin (83.3%). Klebsiella pneumonia was found to be resistant to ciprofloxacin (67.2%) and sensitive to colistin and tigecycline (85.4%). Enterococcus species were found to be resistant to ciprofloxacin (94.5%), but sensitive to tigecycline (100%). CONCLUSION: According to the study, tigecycline was the most sensitive antibiotic while ciprofloxacin was the most resistant antibiotic. It was also identified that the most common probable causative organism was found to be E. coli.

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INTRODUCTION

UTIs are common infections that occur when bacteria, the from skin or rectum enter urethra and infect the urinary tract. The infection affects different parts of the urinary tract, the very common type is bladder infection (cystitis).[1]

It is caused by various kinds of microorganisms such as (bacteria and fungi) which colonize the body. These include: Escherichia coli, Proteus mirabilis, Klebsiella pneumoniae, Enterococcus faecalis, Enterococcus faecium, Enterococcus gallinarum , Staphylococcus saprophyticus, Staphylococcus aureus, Staphylococcus haemolyticus, Staphylococcus sciuri, Pseudomonas aerugonisa , Pseudomonas luteola , Enterobacter species, Acinetobacter baumannii , Candida albicans, Serratia species, Providencia stuartii.[2]

ANTIMICROBIAL RESISTANCE:

When bacteria, fungi, and other microbes develop resistance to the drugs used to kill them, it is said to be antimicrobial resistance. This suggests the germs to grow. Treatment for infections with resistance can be difficult.[1]

- A significant threat to global public health is posed by antibiotic resistance, which is likely to result in at least 150 million in terms of death and financial cost worldwide.[3]
- To be hazardous, bacteria and fungi do not necessarily need to be immune to all antibiotics and antifungals. Resistance to even one drug can lead to serious issues. If antibiotics and antifungals started to lose their effectiveness, we would no longer be able to treat infections and control these hazards to public health. [1]
- Antimicrobial resistance and persistence are linked to an increased likelihood of treatment failure and recurrent infections. Antibiotic resistance is easily detectable using common microbiological tests, and the harm it poses has long been understood.[4]
- Antibiotic resistance is becoming more of an issue in the treatment of simple urinary tract infections. The majority of infections are treated with Trimethoprim-sulfamethoxazole or fluoroquinolone. These agents have a wide antimicrobial spectrum, are used to treat a variety of infections, and have a significant impact on the gastrointestinal flora, increasing the risk of resistant E.coli pathogens.[5]
- The spread of resistance has been aided by widespread antibiotic usage. The incidence of ESBL and AmpC-producing organisms among the Gram-negative Enterobacteriaceae is rising in both hospitals and social contexts, Several multidrug-resistant pathogens, such as methicillin-resistant staphylococcus aureus, vancomycin-resistant enterococci, and gram-negative bacteria that produce extended-spectrum beta-lactamases (ESBLs), that are becoming increasingly prevalent in some clinical settings.[6]
- Antibiotic resistance was frequently seen in ampicillin, piperacillin, clindamycin, amoxicillin/clavulanic acid, and trimethoprim/sulfamethoxazole and the most frequently isolated organisms were E.coli, Klebsiella pneumonia, Proteus mirabilis, Pseudomonas aeruginosa, Enterobacter cloacae, enterococcus faecalis, staphylococcus saprophyticus. [7]
- E.coli is the most frequently found to cause UTI which accounts for most of the cases. Ampicillin was the most resistant antibiotic, followed by amoxicillin, tetracycline, trimethoprim-sulfamethoxazole, and cefalexin among the E.coli isolates. Imipenem, nitrofurantoin, amikacin, chloramphenicol, and ciprofloxacin among ecoli isolates showed the highest sensitivity. [8]
- A recent Indian study targeting ESBL-producing strains in urinary pathogens discovered that E.coli and Klebsiella strains were ESBL-producing. [9]

OBJECTIVES:

✓ To identify the prevalence of resistant microorganisms.
✓ To assess the sensitivity of the antibiotics.
✓ To assess the resistance of the antibiotics.
✓ To identify the prevalence of microorganism's resistant to various antibiotics.
✓ To identify the prevalence of microorganism's sensitivity to various antibiotics.
✓ To assess the severity of UTI patients with other comorbid conditions.
✓ To assess the most common risk factor in UTI patients.

METHODOLOGY

STUDY SITE: The study has carried out in the In-patient department of General Medicine and Nephrology (IPD), microbiology department at a tertiary care hospital, Hyderabad, Telangana.

STUDY DESIGN:

Type of study: A prospective observational study
Place of study: Aware Gleneagles Global hospital
Sample size: 221 patients

STUDY PERIOD: This study was done for six months, from September 2022 to February 2023

INCLUSION CRITERIA:
▪ Both the sexes
▪ The patients with age group between 20-90 years
▪ Patients with urine culture reports
▪ Patients with comorbid conditions like Diabetes mellitus, Hypertension (HTN), renal calculi, AKI, CKD, and structural urologic diseases, etc.

EXCLUSION CRITERIA:
▪ Pregnancy women
▪ Pediatrics
▪ Comatose patients

RESULTS:

Table.1: Percentage of Uropathogens Isolated from Urine Culture Samples.

ORGANISMS	PRESENT	PERCENTAGE
Escherichia coli	69	31.2%
Klebsiella pneumonia	55	24.8%
Pseudomonas aeruginosa	27	12.2%
Enterococcus faecium	18	8.14%
Enterococcus faecalis	12	5.42%
Enterococcus gallinarum	4	1.80%
Staphylococcus species	7	3.16%
Candida species	7	3.16%
Citrobacter species	5	2.26%
Pseudomonas species	3	1.35%
Serratia species	8	3.61%
Morganella morganii	3	1.35%
Proteus mirabilis	3	1.35%

Among the study population of 221 patients, majorly 69(31.2%) patients were isolated with E. coli.
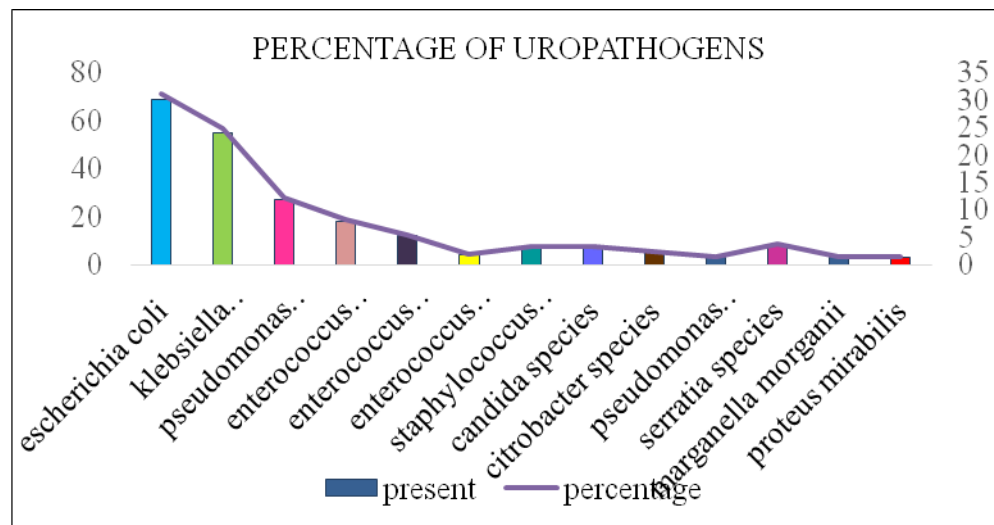

Fig 1: Column Graph Presentation of the Percentage of Uropathogens Isolated from Urine Culture Samples.

TABLE.2: RATE OF DRUG RESISTANCE OF E. COLI TO ANTIBIOTICS:

ANTIBACTERIAL AGENT	NO. OF ORGANISMS RESISTANCE(n=69)	PERCENTAGE
AMPICILLIN	22	31.8%
AMOXICILLIN/CLAVULANIC ACID	30	43.4%
AMIKACIN	5	7.2%
AZTREONAM	8	11.5%
CEFTAZIDIME	8	11.5%
CIPROFLOXACIN	50	72.4%
CEFTRIAXONE	34	49.2%
COLISTIN	1	1.4%
CEFUROXIME	44	63.7%
ERTAPENEM	21	30.4%
CEFEPIME	38	55%
NITROFURANTOIN	2	2.8%
GENTAMICIN	18	26%
IMEPENEM	18	26%
LEVOFLOXACIN	14	20.2%
MEROPENEM	22	31.8%
MINOCYCLINE	2	2.8%
NALDIXIC ACID	22	31.8%
CEFOPERAZONE/SULBACTAM	25	36.2%
SULFAMETHOXAZOLE/TRIMETHOPRIM	38	55%
TICARCILLIN/CLAVULANIC ACID	1	1.4%
PIPERCILLIN/TAZOBACTUM	35	50.7%

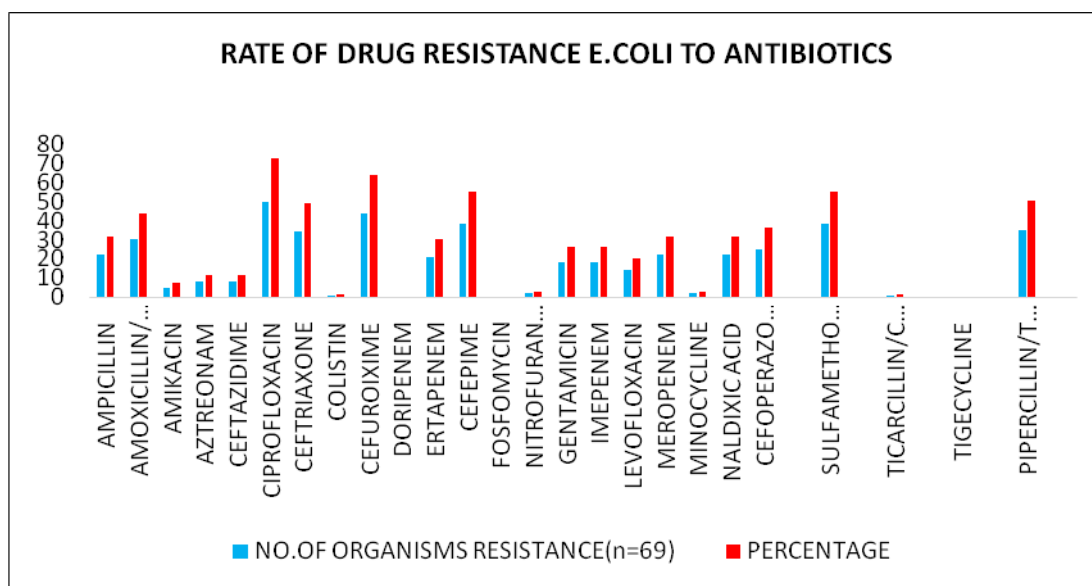Among the patients, E. coli was found to be most resistant to ciprofloxacin (72.4%).

Fig 2: Bar Graph Presentation of the Rate of Drug Resistance E. Coli to Antibiotics.

TABLE.3: RATE OF DRUG SENSITIVITY OF E. COLI TO ANTIBIOTICS.

ANTIBACTERIAL AGENT	NO. OF ORGANISMS SENSITIVE (n=69)	PERCENTAGE
AMPICILLIN	1	1.4%
AMOXICILLIN/CLAVULANIC ACID	19	27.5%
AMIKACIN	61	88.4%
AZTREONAM	6	8.7%
CEFTAZIDIME	6	8.7%
CIPROFLOXACIN	10	14.5%
CEFTRIAXONE	4	5.8%
COLISTIN	65	94.2%
CEFUROXIME	6	8.7%
DORIPENEM	10	14.5%
ERTAPENEM	30	43.4%
CEFEPIME	36	52.1%
FOSFOMYCIN	34	49.2%
NITROFURANTOIN	21	30.4%
GENTAMICIN	48	69.5%
IMEPENEM	43	62.3%
LEVOFLOXACIN	2	2.9%
MEROPENEM	48	69.5%
MINOCYCLINE	14	20.2%
CEFOPERAZONE/SULBACTAM	41	59.4%
SULFAMETHOXAZOLE / TRIMETHOPRIM	28	40.5%
TICARCILLIN/CLAVULANIC ACID	9	13%
TIGECYCLINE	66	95.6%
PIPERCILLIN/TAZOBACTUM	29	42.0%

In our study Among the patients, E.coli was found to be most susceptible to tigecycline (95.6%), and colistin (94.2%).
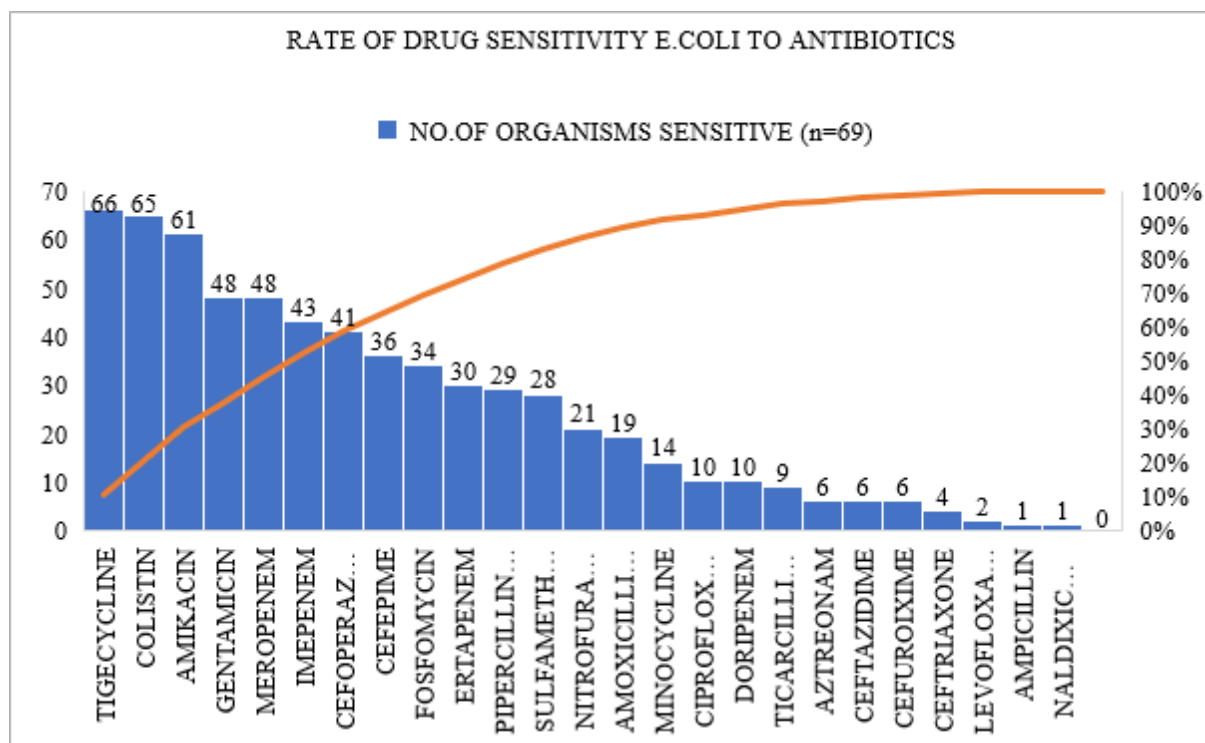

Fig 3: Column Graph Presentation of the Rate of Drug Sensitivity E. Coli To Antibiotics

TABLE.4: RATE OF DRUG RESISTANCE OF PSEUDOMONAS SPECIES TO ANTIBIOTICS.

ANTIBACTERIAL AGENT	NO. OF RESISTANCE ORGANISMS (n=30)	PERCENTAGE
AMIKACIN	15	50%
CEFTAZIDIME	17	56.6%
CIPROFLOXACIN	19	63.3%
CEFTRIAXONE	4	13.3%
COLISTIN	2	6.6%
DORIPENEM	5	16.6%
CEFEPIME	15	50%
GENTAMICIN	13	43.3%
IMEPENEM	21	70%
LEVOFLOXACIN	16	53.3%
MEROPENEM	20	66.6%
MINOCYCLINE	18	60%
SULBACTAM	19	63.3%
TRIMETHOPRIM/SULFAMETHOXAZOLE	26	86.6%
TICARCILLIN/CLAVULANIC ACID	8	26.6%
TIGECYCLINE	11	36.6%
PIPERCILLIN/TAZOBACTUM	18	60%

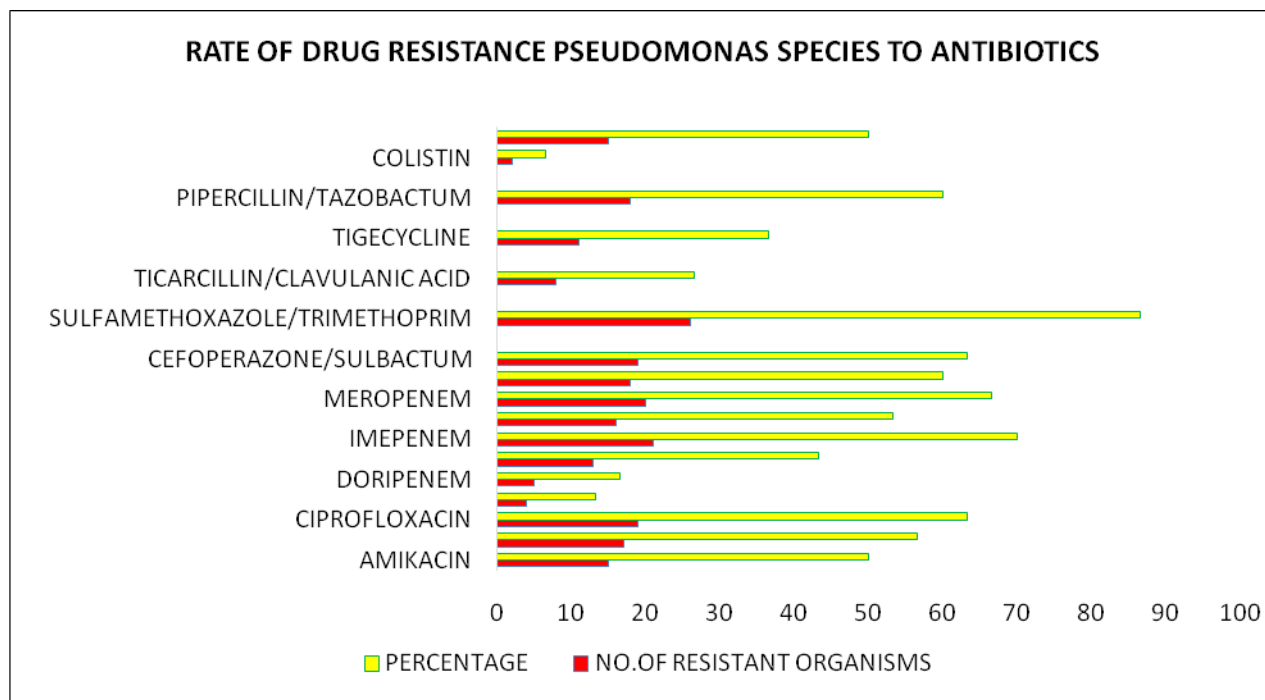Our study, showed pseudomonas species resistant to Trimethoprim/Sulfamethoxazole (86.6%).

Fig 4: Bar Graph Presentation of the Rate of Drug Resistance Pseudomonas Species to Antibiotics.

TABLE.5: RATE OF DRUG SENSITIVITY OF PSEUDOMONAS SPECIES TO ANTIBIOTICS.

ANTIBACTERIAL AGENT	NO. OF SENSITIVE ORGANISMS (n=30)	PERCENTAGE
AMIKACIN	14	46.6%
CEFTAZIDIME	7	23.3%
CIOROFLOXACIN	10	33.3%
CEFTRIAXONE	1	3.3%
COLISTIN	25	83.3%
DORIPENEM	6	20%
CEFEPIME	15	50%
GENTAMICIN	16	53.3%
IMEPENEM	9	30%
LEVOFLOXACIN	8	26.6%
MEROPENEM	10	33.3%
MINOCYCLINE	7	23.3%
CEFOPERAZONE/SULBACTAM	11	36.6%
TRIMETHOPRIM/SULFAMETHOXAZOLE	3	10%
TICARCILLIN/CLAVULANIC ACID	4	13.3%
TIGECYCLINE	3	10%
PIPERCILLIN/TAZOBACTUM	9	30%

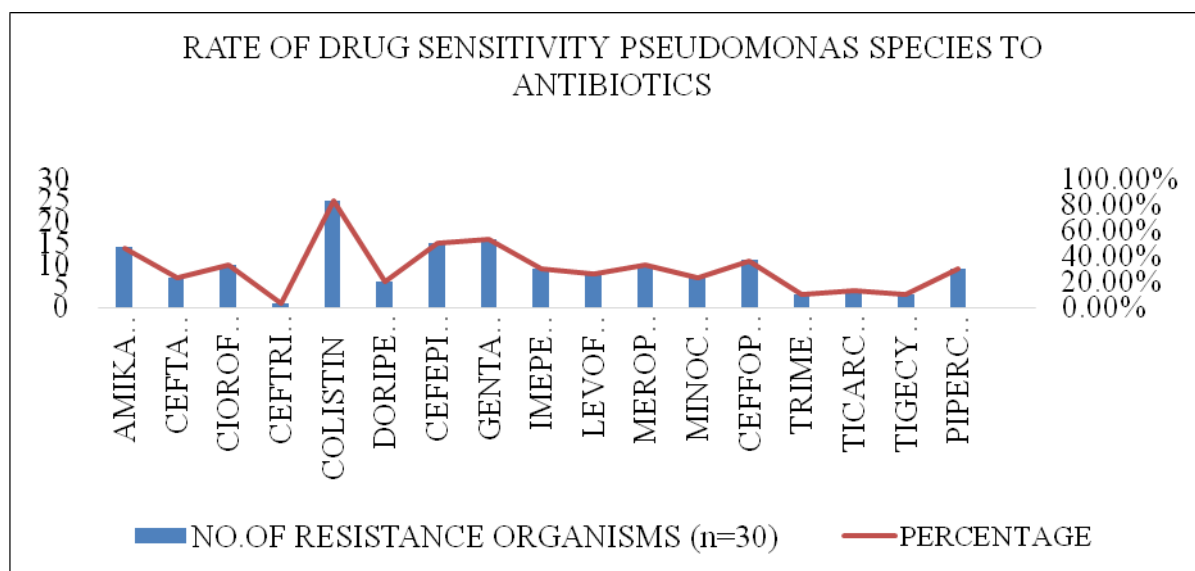In our study, pseudomonas species was found to be most sensitive to Colistin (83.3%).

Fig 5: Column Graph Presentation of the Rate of Drug Sensitivity pseudomonas Species to Antibiotics.

TABLE.6: RATE OF DRUG RESISTANCE OF KLEBSIELLA PNEUMONIA ANTIBIOTICS.

ANTIBACTERIAL AGENT	NO. OF ORGANISMS RESISTANCE(n=55)	PERCENTAGE
AMPICILLIN	13	26.6%
AMOXICILLIN/CLAVULANIC ACID	24	43.6%
AMIKACIN	8	14.5%
AZTREONAM	7	12.75
CEFTAZIDIME	6	11%
CIPROFLOXACIN	37	67.2%
CEFTRIAXONE	32	58.1%
CEFUROIXIME	34	61.8%
ERTAPENEM	24	43.6%
CEFEPIME	34	61.8%
FOSFOMYCIN	16	29%
NITROFURANTOIN	7	12.7%
GENTAMICIN	25	45.4%
IMEPENEM	28	50%
LEVOFLOXACIN	7	12%
MEROPENEM	29	52%
MINOCYCLINE	4	7.2%
NALDIXIC ACID	7	12.7%
CEFOPERAZOSULBACTAMTUM	28	50%
SULFAMETHOXAZOLE/TRIMETHOPRIM	32	58%
TICARCILLIN/CLAVULANIC ACID	3	5.4%
TIGECYCLINE	4	7.27%
PIPERCILLIN/TAZOBACTUM	30	54.5%

In our study population, klebsiella pneumonia was found to be most resistant to ciprofloxacin (67.2%).
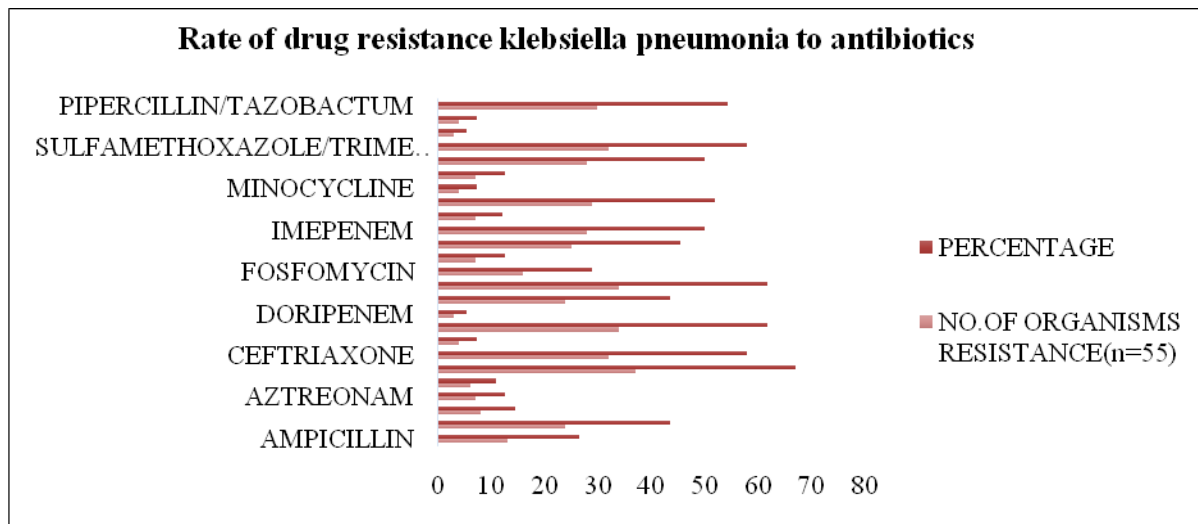

Fig 6: Bar Graph Presentation of the Rate of Drug Resistance Klebsiella pneumonia to Antibiotics

Table.7: Rate of Drug Sensitivity of Klebsiella Pneumonia to Antibiotics.

ANTIBACTERIAL AGENT	NO. OF ORGANISMS SENSITIVITY(n=55)	PERCENTAGE
AMOXICILLIN/CLAVULANIC ACID	20	36.6%
AMIKACIN	43	78.1%
CEFTAZIDIME	1	1.81%
CIPROFLOXACIN	14	25.4%
CEFTRIAXONE	12	21.8%
COLISTIN	47	85.4%
CEFUROIXIME	10	18.1%
DORIPENEM	2	3.63%
ERTAPENEM	20	36.3%
CEFEPIME	17	30.9%
FOSFOMYCIN	17	31%
NITROFURANTOIN	2	3.63%
GENTAMICIN	26	47.2%
IMEPENEM	23	41.8%
MEROPENEM	22	40%
MINOCYCLINE	3	5.4%
NALDIXIC ACID	6	11%
CEFOPERSULBACTAMBACTUM	23	41.8%
SULFAMETHOXAZOLE/TRIMETHOPRIM	19	34.5%
TICARCILLIN/CLAVULANIC ACID	2	3.6%
TIGECYCLINE	47	85.4%
PIPERCILLIN/TAZOBACTUM	21	38.1%

In our study population, klebsiella pneumonia was found to be the most sensitive to colistin and Tigecycline (85.4%).
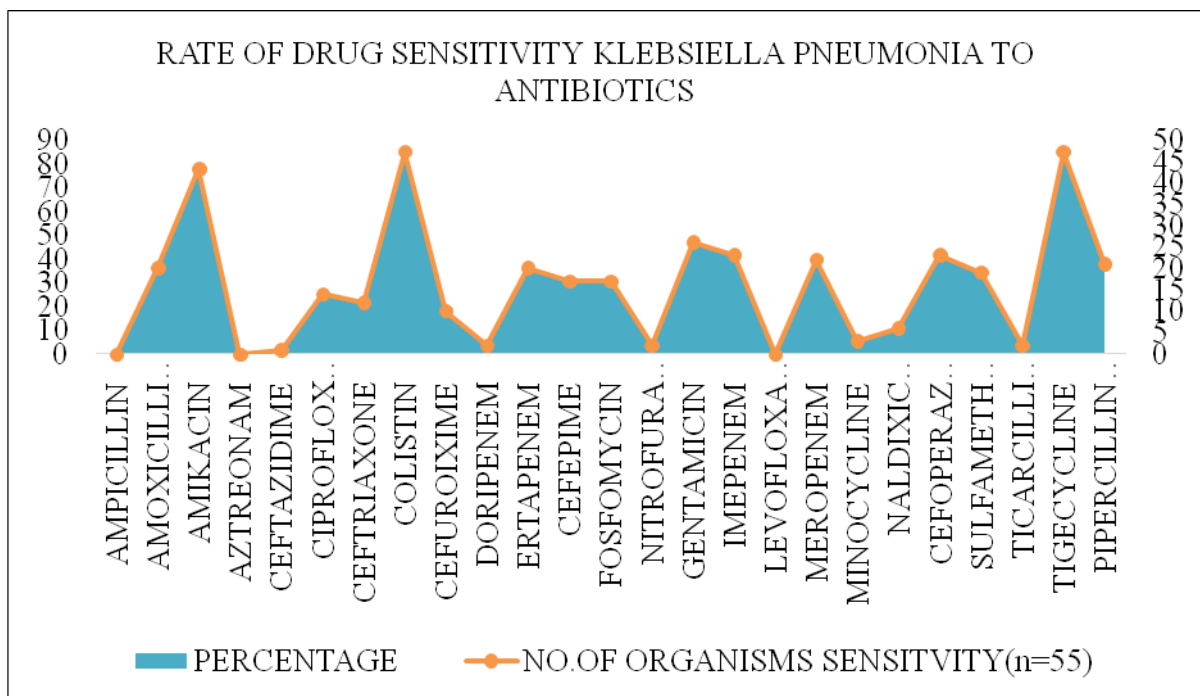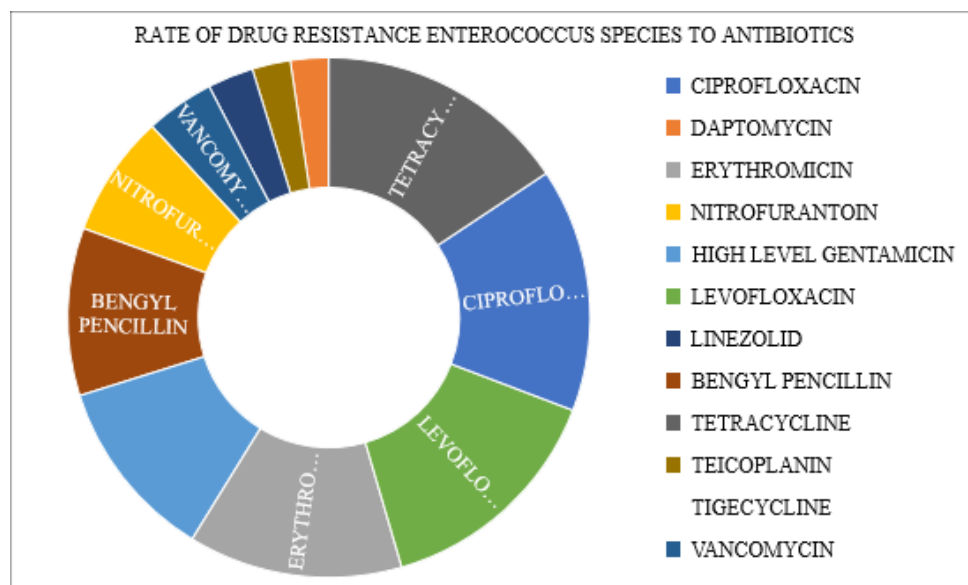

Fig 7: Column Dotted Line Graph Presentation of the Rate of Drug Sensitivity Klebsiella Pneumonia to Antibiotics.

TABLE.8: RATE OF DRUG RESISTANCE OF ENTEROCOCCUS SPECIES TO ANTIBIOTICS.

ANTIBACTERIAL AGENT	NO. OF ORGANISMS RESISTANCE (n=34)	PERCENTAGE
CIPROFLOXACIN	32	94.5%
DAPTOMYCIN	5	14.7%
ERYTHROMYCIN	28	82.3%
NITROFURANTOIN	16	47%
HIGH LEVEL GENTAMICIN	24	70.5%
LEVOFLOXACIN	31	91.1%
LINEZOLID	6	17.6%
BENGYL PENICILLIN	22	64.7%
TETRACYCLINE	33	97%
TEICOPLANIN	5	14.7%
TIGECYCLINE	0	0%
VANCOMYCIN	9	26.4 %

Our study showed Enterococcus species resistant to drugs like ciprofloxacin (94.5%), and Levofloxacin (91.1%).

Fig 8: Sunburst Graph Presentation of the Rate of Drug Resistance Enterococcus Species to Antibiotics.

Table.9: Rate of Drug Sensitivity of Enterococcus Species to Antibiotics.

ANTIBACTERIAL AGENT	NO. OF ORGANISMS SENSITIVITY(n=34)	PERCENTAGE
CIPROFLOXACIN	2	5.8%
DAPTOMYCIN	7	20.5%
ERYTHROMYCIN	6	17.6%
NITROFURANTOIN	18	52.9%
HIGH LEVEL GENTAMICIN	10	29.4%
LEVOFLOXACIN	3	8.8%
LINEZOLID	28	82.3%
BENZYL PENICILLIN	12	35.2%
TETRACYCLINE	1	2.9%
TEICOPLANIN	29	85.2%
TIGECYCLINE	34	100%
VANCOMYCIN	25	73.5%

Our study showed Enterococcus species sensitive to drugs like Tigecycline (100%), Teicoplanin (85.2%).
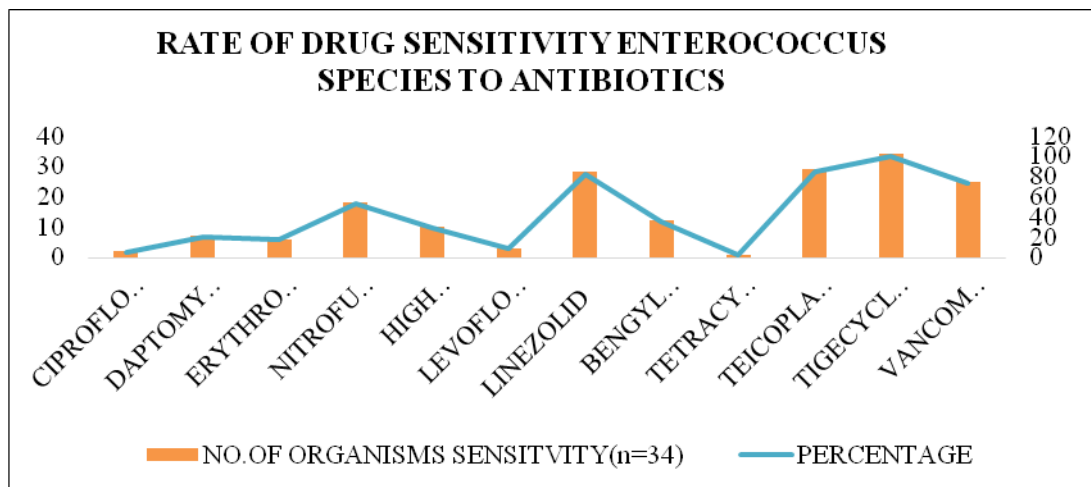
Fig 9: Column graph presentation of the rate of drug sensitivity enterococcus species to antibiotics.

Table.10: Distribution of Most Common Antibiotics Resistant to Uropathogens.

RESISTANT ANTIBIOTICS	NO.OF RESISTANT ORGANISMS	PERCENTAGE
AMPICILLIN	35	15.8%
AMOXICILLIN/CLAVULANIC ACID	59	26.6%
AMIKACIN	33	14.9%
AZTREONAM	20	9%
CEFTAZIDIME	36	16.2%
CIPROFLOXACIN	160	72.3%
CLINDAMYCIN	5	2.26%
CEFTRIAXONE	84	38%
COLISTIN	13	5.8%
CEFUROXIME	83	37.5%
ERYTHROMYCIN	35	15.8%
ERTAPENEM	48	21.7%
CEFEPIME	96	43.4%
FOSFOMYCIN	18	8.1%
NITROFURANTOIN	27	12.2%
GENTAMICIN	65	29.4%
IMIPENEM	72	32.5%
LEVOFLOXACIN	75	34%
MEROPENEM	73	33%
MINOCYCLINE	29	13.1%
NALIDIXIC ACID	31	14%
BENZYL PENICILLIN	29	13.1%
CEFOPERAZONE/SULBACTAM	78	35.2%
SULFAMETHOXAZOLE/TRIMETHOPRIM	109	49.3%
TICARCILLIN/CLAVULANIC ACID	14	6.3%
TETRACYCLINE	38	17.19%
PIPERCILLIN/TAZOBACTUM	92	41.6%
VANCOMYCIN	10	4.5%

Based on our study among 221 patients, the most common antibiotic-resistant uropathogens were found to be ciprofloxacin with 72.3%.
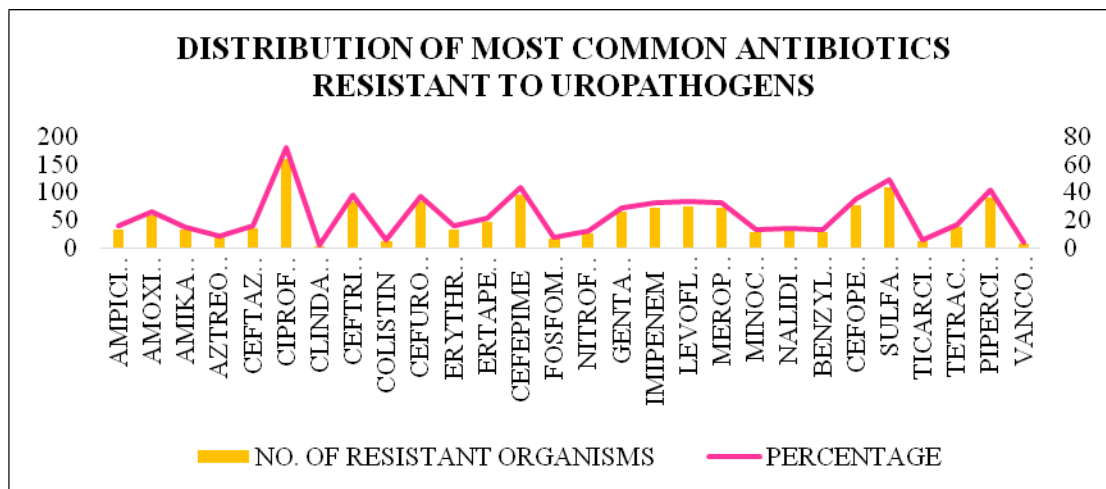
Fig.10: Column Line Graph Presentation of the Distribution of Most Common Antibiotics Resistant toUropathogens.

Table.11: Distribution of Most Common Antibiotics Sensitive toUropathogens.

SENSITIVE ANTIBIOTICS	NO. OF SENSITIVE ORGANISMS	PERCENTAGE
AMOXICILLIN/CLAVULANIC ACID	43	19.4%
AMIKACIN	137	62%
AZTREONAM	16	7.2%
CEFTAZIDIME	24	10%
CIPROFLOXACIN	51	23%
CEFTRIAXONE	25	11.3%
COLISTIN	150	67.8%
CEFUROXIME	17	7.6%
ERTAPENEM	54	24.4%
CEFEPIME	75	34%
FOSFOMYCIN	55	24.8%
NITROFURANTOIN	52	23.5%
GENTAMICIN	112	50.6%
IMIPENEM	98	44.3%
LEVOFLOXACIN	26	11.7%
LINEZOLID	34	15.3%
MEROPENEM	98	44.3%
MINOCYCLINE	32	14.4%
CEFOPERAZONE/SULBACTAM	93	42%
SULFAMETHOXAZOLE/TRIMETHOPRIM	68	30.7%
TICARCILLIN/CLAVULANIC ACID	23	10.4%
TEICOPLANIN	35	15.8%
TIGECYCLINE	170	76.9%
PIPERCILLIN/TAZOBACTUM	74	33.4%
VANCOMYCIN	31	14%

Based on our study among 221 patients, the most common antibiotic-sensitive to uropathogens were found to be Tigecycline (76.9%).
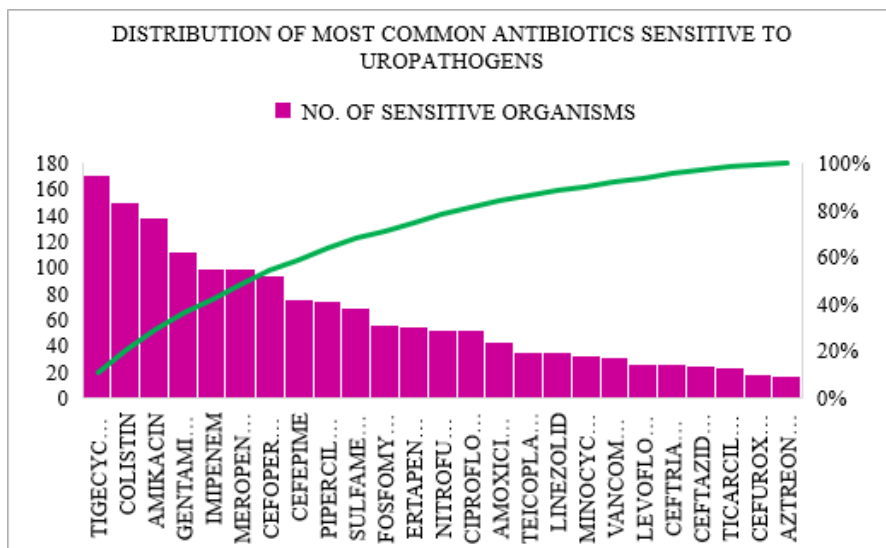
Fig 11: Column Graph Presentation Distribution of Most Common Antibiotics Sensitive toUropathogens.

TABLE.12: MOST COMMON RISK FACTORS IN UTI PATIENTS.

RISK FACTOR	NO. OF PATIENTS	PERCENTAGE
Diabetes mellitus	71	32.12%
Recurrent UTI	21	9.50%
BPH	2	0.90%
Neurological disorders	8	3.61%
Renal calculi	5	2.26%

Based on our study among 221 patients, the most common risk factor in UTI patients is Diabetes mellitus (32.1%), Recurrent UTI(9.50%).
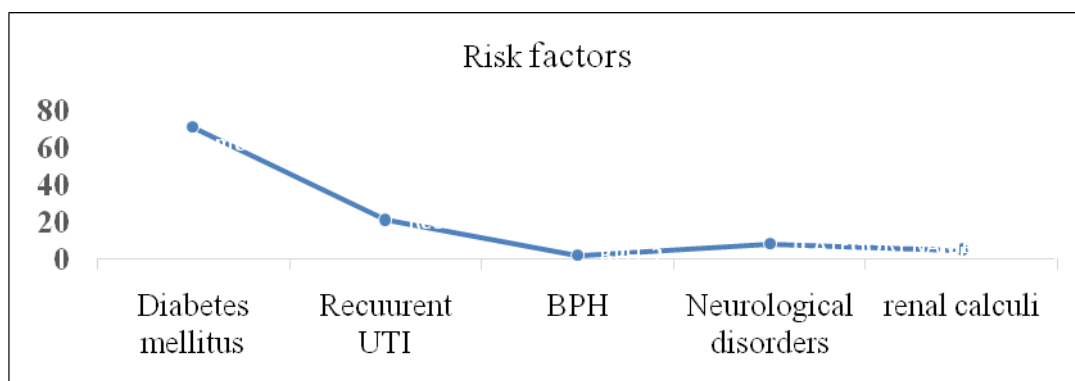

Fig 12: Line Graph Presentation of Most Common Risk Factors In UTI Patients.

DISCUSSION

For initiation of empirical therapy for UTIs should have better knowledge about the common pathogen causing UTIs in the population, this helps in the ration use of antibiotics and decreases the resistance of antibiotics to pathogens related to UTIs. The present study analyzed 221 urine cultures.

- In the previous study it was seen that the highest resistance rate was seen with sulfamethoxazole that is 35.56% followed by the second highest rate with a percentage of 26.67% to E. coli[10], whereas in the present study, the highest resistant rate was seen with ciprofloxacin antibiotic that is 72.4% and the second highest resistance rate was encountered with cefuroxime 63.7% to E. coli.
- In our study it was observed that 110 females 49.7% and 111 males 50.2% suffered from urinary tract infections, whereas in the previous study carried out it was seen that 217 females and 207 males were suffering from urinary tract infections[11].
- In the previous study it was seen that the most common gram-negative bacteria were E.coli 12%, proteus 4%, and klebsiella 7.4%[11], in our study conducted the most common gram-negative bacteria was found to be E.coli 31.2%, klebsiella pneumonia 24.8% and pseudomonas aeruginosa 12.2%.

- The common uropathogens in our study were 221, in that gram-negative bacteria are 173(78.2%), gram-positive are 41(18.55%) and fungi are (3.16%). In that gram-negative, the most common micro-organism is E. coli, whereas, in the previous study, the gram-negative bacteria are 61.2%and gram positive 30.4%and fungi were 8.4% [11].
- In our current study it was found that the age group between 61-70 suffered more from UTI and in the older study that was conducted it was seen that the patients belonging to the age group of 5-55 suffered from UTI[12].
- In the present study, Klebsiella pneumonia showed more resistance to Imipenem, Ciprofloxacin, ceftriaxone, cefuroxime Cefepime, and ertapenem, and shows high sensitivity to Amikacin Tigecycline. But the previous study shows high sensitivity to Ertapenem but it was resistant, the highly Sensitive became resistant shows how the micro-organisms develop resistance to antibiotics. [13]
- In our present study it was conducted that the major risk factor for the development of UTI was diabetes mellitus which is 32.12%, and in the previous study carried out it was observed that diabetes mellitus was the most common risk factor [14].
- In the present study the impact of ESBL-producing bacteria was increasing in which the sample consisting of 221 patients with positive culture growth to microorganisms, in that it showed 43(19.45%) urine cultures that shows ESBL. In the previous study, it was showed 30% with a sample size of 824 patients in 2015[15].
- In the present study the impact of ESBL-producing bacteria was found to be 19.45% in which the sample consisted of 221 patients with positive culture growth to microorganisms. In the previous study, it was showed 30% with a sample size of 824 patients in 2015[15].
- According to the previous study patients affected with UTIs were affected with the most common uropathogens E. coli 62% with antibiotic sensitivity to amikacin (70%), nitrofurantoin (82%), ciprofloxacin (72%) and resistance to ampicillin (86%), amoxicillin (76%)[16].But in our study, it was observed that the sensitivity rate of E. coli to amikacin (88.4%), nitrofurantoin (30.4%), ciprofloxacin (14.5%), and the resistant rate was ampicillin (31.8%), amoxicillin (43%). By this, we conclude that sensitivity towards nitrofurantoin and ciprofloxacin was decreased.

CONCLUSION

In our current study, which was carried out in Aware Gleneagles Global Hospital, was to study the Insights on resistance and sensitivity patterns of various uropathogens and their management in urinary tract infections.

- The study was carried out in 221 patients, and during the study, it was found that the prevalence of urinary tract infections was more in males (50.2%) which is more than in females (49.7%).
- Among all the studies, diabetes mellitus and hypertension were the most usual risk factor found in the patients.
- In the currently performed study, it was shown that males between the ages of 51-60 (25.2%) and females between the ages of 61-70 (29%) were more susceptible to UTI.
- The most probable signs and symptoms that appeared in patients were found to be high-grade fever (27.14%) and burning micturition (7.23%).
- In the overall study the gram-negative (78.2%), gram-positive (18.55%), and fungi (3.16%) were discovered to be the most prevalent uropathogens responsible for UTIs.
- As per the distribution of UTI patients with comorbid conditions exceeded those without comorbidities.
- In the present research the most resistant antibiotic was found to be ciprofloxacin and the sensitive was found to be tigecycline.
- E. coli was found to be susceptible to tigecycline but had greater ciprofloxacin resistance.
- Pseudomonas aeruginosa was susceptible to colistin but had greater trimethoprim/sulfamethoxazole resistance.
- Klebsiella pneumonia is susceptible to colistin and tigecycline but has better resistance to ciprofloxacin.
- The enterococcus species were susceptible to tigecycline but had resistance to ciprofloxacin.
- The prevalence of various resistant uropathogens to antibiotics was ESBL (19.45%), MDRO (8.1%), CRE (24.8%), VRE (2.71%).

Future research recommendsconsidering other approaches in reducing the resistance of antibiotics towards uropathogens by providing rationaluse of antibioticsand preserve antibiotics for the future usage.

CONFLICT OF INTEREST

The author declares no conflict of interest.

ABBREVIATIONS:

UTI	: Urinary tract infections	AKI	: Acute Kidney Injury
E. coli	: Escherichia coli	BPH	: Benign Prostatic Hyperplasia
ESBL	: Extended Spectrum Beta Lactamase	MDRO	: Multi Drug Resistant Organisms
HTN	: Hypertension	CRE	: Carbapenem-Resistant Enterobacterales
CKD	: Chronic Kidney Disease	VRE	: Vancomycin-Resistant Enterococci

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