

Microbiological profile & antimicrobial susceptibility pattern of isolates causing urinary tract infections in rural eastern Uttar Pradesh¹Pratiksha Srivastava, ²Padmawati Gautam, ³Atosh Tripathi, ⁴Dakshina Bisht¹Assistant Professor, Department of Microbiology, Government Medical College & Super Facility Hospital, Azamgarh, U.P., India²Assistant Professor, Department of Obs & Gynae, Government Medical College & Super Facility Hospital, Azamgarh, U.P., India³Assistant Professor, Department of Microbiology, Government Medical College & Super Facility Hospital, Azamgarh, U.P., India⁴Professor, Department of Microbiology, Santosh Medical College, Ghaziabad, NCR, Delhi, India**Correspondence Author:** Atosh Tripathi, Assistant Professor, Department of Microbiology, Government Medical College & Super Facility Hospital, Azamgarh, U.P., India.**Type of Publication:** Original Research Paper**Conflicts of Interest:** Nil**Abstract**

Urinary tract infections are the most common infections caused by bacterial pathogens. Knowledge of etiology & antibiotic susceptibility pattern of the organism causing urinary tract infection is essential as nowadays resistance towards antimicrobials is very common & it is difficult to treat with the limited treatment options. The study was conducted in Azamgarh from November 2016 to May 2018, to know the prevalence of various microorganisms causing urinary tract infections & its different susceptibility pattern to antibiotics. Urine sample was collected & processed aseptically in sterile condition & observed for growth of microorganisms. Total 745 samples were collected among that 328 samples (44%) came out as positive. 86% positive samples were from the female patients while 14% samples came from male patients. Maximum growth shown by the *Escherichia coli* (41%) followed by *Klebsiella pneumoniae* (18%), *Pseudomonas aeruginosa* (12%), *Staphylococcus aureus*

(10%), *Proteus spp* (07%), *Candida* (06%), *Enterococcus spp* (04%), *Enterobacter spp* (02%) & *Citrobacter spp* (01%). Isolated microorganisms showed maximum resistance to Ampicillin & Ciprofloxacin while maximum sensitivity to Amikacin, Imipenem & Piperacillin. *S.aureus* showed maximum sensitivity to Vancomycin. The erratic & indiscriminate use of antibiotics leads to MDR bacteria. It is very important to treat patients with empiric antibiotic treatment & prevent the dissemination of the resistant bacteria as well as health education also plays very major role to prevent urinary tract infection in community.

Keywords- Urinary tract infection, *Escherichia coli*, Antibiotic susceptibility test, Multidrug resistance bacteria**Introduction**

Urinary tract infection is one of the most common infections occurring in all age groups from neonates to old age. It is more common in females as compared to males due to shorter urethra & sexually active life during

reproductive age group (Humayun et al). The other predisposing factors are pregnancy, use of contraceptive method, urinary tract abnormality, blockage in the tube due to kidney stones or benign prostatic hyperplasia, suppressed immune system or any other surgical intervention of the urinary tract (Tuli et al).

UTI is described as infection of the kidney, ureter, bladder or urethra with symptoms include urgency & frequency of urination, pain or burning micturition, milky or cloudy urine or even red color urine because of the presence of pus cells & RBC's respectively. It may involve both upper & lower tracts. Other predisposing factors for UTI are kidney stones, catheterization, & immunocompromised (diabetes mellitus, cancer, steroid therapy, HIV & organ transplantation) (Neha garg et al).

The organisms responsible for UTI are usually *Escherechia.coli*, *Klebsiella spp*, *Enterococcus spp*, *Citrobacter spp*, *Pseudomonas aeruginosa*, *Proteus spp*, *Staphylococcus aureus*, *Candida spp* etc. Diagnosis of pathogens causing UTI & its antimicrobial susceptibility pattern is very helpful in treatment & prevention of dissemination of the UTI. Nowadays increasing incidences of resistance to commonly used antibiotics are very common & it is very difficult to treat the resistant UTI which is leading us to post antibiotic era.

AIM and Objective

The study was planned to know the prevalence of common microorganisms causing UTI & its antibiotic susceptibility pattern in eastern Uttar Pradesh region.

Material and Methods

Study Design

The study was conducted in the Department of Microbiology, Government Medical College, Azamgarh from November 2016 to May 2018 (19 months).

Sample Collection and Processing

Clean caught mid-stream urine was collected from patients referred by physicians, in sterile wide mouthed

container labelled with information of patient's age, sex & brief clinical history. In case of patients where sample collection was difficult suprapubic aspirates were collected. In case of catheterized patients, catheter tube was cleaned & clamped & sample was collected aseptically by disposable syringe. The sample was immediately transferred to microbiology laboratory for culture & antibiotic sensitivity test. Urine sample was processed within one hour of receiving & collection & if not then refrigerated at 4 degree celsius until processed.

Direct Microscopy

Wet mount examination was performed to look for the presence of pus cells, epithelial cells, crystals & microorganisms.

Bacterial Identification

Urine sample was processed on Macconkey agar & CLED agar by semi quantitative method with the help of sterile calibrated loop and incubated aerobically at 37 degree celsius for about 24-48 hrs. Urine culture plates were examined for growth of bacteria. Growth of $>10^5$ colony forming unit / ml was considered as significant.

Identification of the bacteria was done on the basis of cultural characteristics, gram staining & biochemical reactions. The isolates were subjected to Antibiotic susceptibility test on Mueller hinton agar by Kirby Bauer disk diffusion method as per CLSI guidelines using the commercially available antibiotic discs. The antibiotics used were- Amikacin, Gentamicin, Ceftazidime, Nitrofurantoin, Norfloxacin, Ciprofloxacin, Ampicillin, Imipenem, Piperacillin, Vancomycin & Oxacillin.

Lawn culture was performed on Mueller hinton agar with the help of sterile cotton swab & antibiotic discs were placed on the plate & incubated at 37 degree celsius overnight. Diameter of zone of inhibition is measured in millimetres as per guidelines provided by the manufacturer & grouped into Sensitive, Intermediate & Resistant.

Result and Discussion

A total of 745 samples were collected in the study, of that 328 samples showed significant growth with culture positivity rate of 44%. The remaining were either sterile or did not show any significant growth.

Among 328 positive samples 283 (86%) were female patients & remaining 45 (14%) were males.

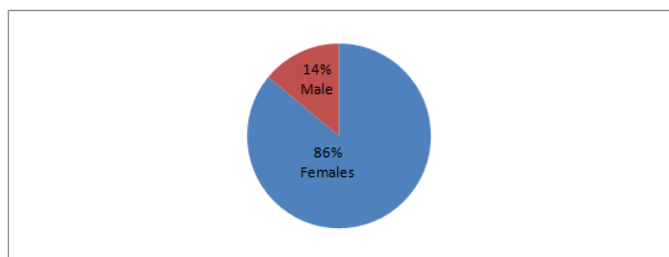


Figure 1 Male & Female ratio of UTI

S.No.	Sex	Number of samples processed	Number of positive samples	Percentage
1.	Male	183	45	24.59%
2.	Female	562	283	50.3%
	Total	745	328	44%

Table 1: Sex wise distribution of sample

As maximum number of the positive samples were from the females (86%) in the age group between 21-40 years of age. Similar results were shown by the Mahajan et al.,(2016) that is due to the close proximity of the female urethra to the source of bacteria (eg. Anus, vagina). Females are more prone to UTI than males as they lack bacteriostatic property of prostatic secretions (Al-Jebouri, M.M. 1989). The other factors are sexually active life during these years, multiple sex partners, use of intra uterine device & other barrier method of contraception, gravid uterus in pregnancy, hormonal changes can also lead towards the urinary tract infections (Tuli et al.,2016). In our study, rate of isolation of urinary pathogen is 44% that is similar to many studies like Lata B Galate et

al.,(2015) found isolation rate of urinary pathogen 42.89%. Another study done in Bhubaneswar has reported 51.66% prevalence of isolation of urinary pathogen (Behera et al.,2016).

In our study among the pathogenic bacteria isolated *Escherechia coli* is the most frequently isolated urinary pathogen (41%) followed by *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus spp*, *Candida spp*, *Enterococcus spp*, *Enterobacter spp*, *Citrobacter spp*. The result of this study is in accordance to the studies of (Galate et al.,2015 from Vishakhapatnam), (Joshi et al.,2011 from bareilly), (John et al., 2015 from Andhra Pradesh). These studies also showed maximum prevalence of *Escherechia coli* followed by *Klebsiella pneumoniae*. While some other studies by (Aboderin et al.,2009) recorded *Pseudomonas aeruginosa* as the predominant bacteria in urinary tract infection & (Garg et al.,2015 from Aligarh) found *Citrobacter spp* as the second most commonly isolated uropathogen after *Escherechia coli*.

In our study we found *Candida* isolates (05%) which is similar to study of Mahajan et al.,2016 as they got prevalence of *Candida* was 4.5% while Maria et al.,2015 found 11% prevalence of *Candida* in their study.

S. No.	Pathogen isolated	Total number	Percentage
1	Escherechia coli	134	41 %
2	Klebsiella pneumoniae	59	18 %
3	Pseudomonas aeruginosa	39	12 %
4	Staphylococcus aureus	34	10 %
5	Proteus spp	24	07 %
6	Candida spp	17	06 %
7	Enterococcus spp	12	04 %
8	Enterobacter spp	06	02 %
9	Citrobacter spp	03	01 %

Table 2 : Isolated Pathogens with their prevalence rate
In our study gram negative bacteria were the predominant bacteria isolated (81%) followed by gram positive (14%) which is similar to the study of (Al-Jebouri.,2006)

Organism	Amp	Ak	Cf	Ca	G	Nf	Ni	Imp	Pi	Va	Oxa
E.coli	21	91	33	55	63	76	72	93	89	-	-
Klebsiella pneumoniae	24	89	26	68	56	73	71	93	91	-	-
Pseudomonas spp	32	78	41	63	67	88	81	96	93	-	-
Proteus spp	45	74	58	79	87	53	83	88	93	-	-
S.aureus	72	-	-	-	88	63	71	-	-	93	43
Enterococcus spp	84	-	-	-	86	67	78	-	-	97	33

Table 3: Antibiotic Sensitivity pattern of the isolated uropathogens,

Amp- Ampicillin, Ak- Amikacin, Cf- Ciprofloxacin, Ca- Ceftazidime, G- Gentamicin, Nf- Norfloxacin, Ni- Nitrofurantoin, Imp- Imipenem, Pi- Piperacillin. Va- Vancomycin, Ox- Oxacillin

In our study isolated gram negative bacilli showed high level resistance to Ampicillin & Ciprofloxacin. The organisms also showed resistance to Ceftazidime & Gentamicin also. Resistance for Ciprofloxacin has been increasing over day by day & it showed highest resistance in this study also which is similar to the study of Akram et al & Shalini et al.,2011.

Amikacin, Imipenem, Piperacillin & Nitrofurantoin were most effective antibiotics in this study which is similar to the study of M. Eshwarappa et al.,2011. Joshi et al.,2011 has discussed very positive outcome of Nitrofurantoin against uropathogens as it is urinary antiseptic & cost effective. Multiple drug resistance in uropathogenic *E.coli* was discussed by Niranjana et al.,2014 due to its widespread prevalence in the community. Isolated gram positive cocci were sensitive for Vancomycin in this study which is similar to the study of Garg et al.,2015.

Conclusion

The present study on the bacteriological profile & its antibiotic susceptibility pattern in this area showed rate of infection as well as high level of resistance of uropathogens towards antibiotics which could be due to the inappropriate use of antibiotics. Multiple drug resistant uropathogens are continuous threats to the community. To

treat the MDR Bacteria with effective empiric antibiotic treatment & to prevent its dissemination will be the most effective step. But resistance among bacteria is a continuous & evolving process so regular surveillance & monitoring is required. Treatment should start after getting the antibiotic susceptibility report & right dose for appropriate period of time will be helpful. Beside this proper sanitation & health education in rural background is also very important to prevent the infections.

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