BACTERIAL ISOLATES AND THEIR ANTIBIOTIC SENSITIVITY PROFILE RECOVERED FROM URINE SAMPLES IN NCR, GHAZIABAD (UTTAR PRADESH)

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ABSTRACT: BACKGROUND: UTI is a very common problem and maximum number of samples received in a clinical microbiology laboratory belongs to this category. Knowing the most common isolates in Urinary Tract Infection [UTI] patients and their antibiotic sensitivity pattern can help the clinicians in prescribing highly targeted therapy which is beneficial to both patients as well as to community. **AIMS AND OBJECTIVE:** To evaluate the percentage of various aerobic bacteria isolated from urine of suspected urinary tract infection patients and their antibiotic sensitivity pattern which will guide in prescribing near perfect empirical therapy. **MATERIALS AND METHODS:** 328 urine samples were processed as per standard protocol and antibiotic sensitivity was performed by Kirby Bauer disc diffusion method. **RESULTS:** Out of 328 urine samples, 125 were culture positive for bacterial growth. E. coli was the most common bacteria isolated followed by Klebsiella species. followed by Pseudomonas species. Staphylococcus aureus was the most common Gram positive isolate followed by Enterococcus species. Piperacillin tazobactam and meropenem were highly effective (78%) for E. coli whereas ofloxacin was least effective (26%). Among Gram positive isolate like Staphylococcus 100% sensitivity was seen towards vancomycin, linezolid and teicoplanin. **CONCLUSION:** Knowing predominant organism and their sensitivity pattern in UTI patients in a particular area can check antibiotic misuse and hence emergence of resistant strains.

KEYWORDS: UTI, Gram positive bacteria, Gram negative bacteria, AST.

INTRODUCTION: Urinary tract infection (UTI) is a common problem affecting males and females and all age groups.^{1, 2} Worldwide every year approximately US\$ 6billion³ are spent annually on its treatment and productive time is lost in morbidity. UTI is traditionally described as a bacteriuria with presence of signs and symptoms viz. burning micturition, dysuria, frequency, flank pain, hematuria and high grade fever with chills.²

UTI can affect lower and sometimes both lower and upper urinary tracts. Upper UTI is typically referred to as infection of kidneys i.e. pyelonephritis and lower UTI is infection of bladder and urethra. The presence of the lower UTI symptoms does not exclude the upper UTI which is often present in most UTI cases.³

UTI can be classified into "uncomplicated" and "complicated". Uncomplicated UTI are those that occur in young, healthy, non-pregnant women; complicated UTIs are all other UTIs. Complicated UTI are usually found in people with diabetes, structural abnormalities of the urinary tract, presence of stone in urinary tract etc. The differentiation between complicated and uncomplicated UTI is important because it affects both spectrum of bacteria involved and the duration of antibiotic treatment required.⁴

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UTI is more common in females than in males as female urethra structurally is found less effective for preventing the bacterial entry.⁵ It may also be due to the proximity of the genital tract⁶ and urethra, pregnancy and sexual activity.⁷

It is of great importance to know the prevalent microorganism causing UTI in a particular area and its antibiotic sensitivity pattern as highly targeted specific empirical therapy can be provided to the patient which may at times be the same as definitive therapy.⁸ This helps in saving time, money, prevents emergence of resistant strains and protects our antibiotic reserve which is already depleting due to irrational use of antibiotics.⁹

This study was designed to know the most common pathogens causing UTI in NCR, Ghaziabad and their antibiotic sensitivity pattern so that specific anti-biogram based therapy can be given to the patients which will also help in preventing emergence of resistant strains.

MATERIALS AND METHODS: 328 urine samples from patients suspected of UTI were processed in the laboratory from a period of July 2013 to March 2014. With a calibrated loop urine sample was inoculated on CLED media and incubated aerobically at 37°C and after 24 hours growth was observed. After Gram stain and biochemical identification using TSI (triple sugar iron), SIM (sulfide indole motility) sugar fermentation tests viz. glucose, sucrose, lactose and maltose, urease production and citrate utilization,⁹ AST was performed on Mueller Hinton Agar according to CLSI guidelines (CLSI2012).

Antibiotics were selected according to strain and all the media and antibiotics were procured from Hi Media (Mumbai). Following antibiotics were used to perform AST depending on organism - Ampicillin (amp) 10µg, Cefazolin (cz) 30µg/Cephalexin, Cotrimoxazole (cot) 1.25+23.75µg, Nitrofurantoin (nit) 300µg, Norfloxacin (nx) 10µg, Ofloxacin (of) 5µg, Gentamicin (gen) 10µg, Amikacin (ak) 10µg, Ceftazidime (caz) 30µg, Cftzdm+Clavulanic, Cefotaxime (ctx)30µg/Ceftriaxone (ctr) 30µg, Piperacillin+ tazobactam (pit) 100µg+10µg, Amoxycillin+Clavulanic acid(cac) 20µ g+ 10µg, Meropenem (mrp)10µg, Piperacillin (pi)/ Carbenicellin100µg, Tobramycin 10µg, Cefepime(cpm) 30µg, Imepenem (imp)10µg, Polymyxin B (pol B) 300 units, Penicillin G (10units)/ Ampicillin (amp)10 µg, Cefoxitin (cxt) 30µg, Linezolid (lz) 30µg, Teicoplanin (te) 30 µg, Vancomycin (van) 30µg.

RESULTS:

Fig. 1: Results of overnight urine cultures incubation at 37° C

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1. Urine cultures showing growth 38% (125/328)
2. Urine cultures showing no growth 58% (190/328)
3. Cultures showing contamination 2.7% (9/328).
4. Cultures showing Candida growth 1.2% (4/328).

Fig. 2: Showing distribution of organisms recovered from positive culture samples

1. E. coli
2. Klebsiella sp.
3. Pseudomonas sp.
4. Proteus sp.
5. Enterobacter sp.
6. Acinetobacter sp.
7. Staphylococcus aureus.
8. Enterococcus sp.

	E.coli	Klebsiella	Pseud.	Proteus	Enterob.	Enteroc.	Staph.
Ampicillin	40	0	-	0	33	80	40
Cefazolin	40	40	-	33	33	-	-
Cotrimox.	40	40	-	0	33	-	-
Nitrofurant.	74	80	-	0	66	61	60
Norflo.	33	40	48	0	66	52	30
Ofloxacin	26	60	50	33	100	-	-
Gentamicin	70	60	45	66	66	24	-
Amikacin	70	60	47	100	66	-	70
Ceftazidme	48	40	55	33	66	-	-
Ceftriaxone	48	40	62	33	66	-	-
Pip-tzbctm	78	40	85	100	100	-	-

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Amox-clav	52	0	-	100	100	-	-
Meropenem	78	60	100	100	100	-	-
Piperacillin	-	-	42	-	-	-	-
PolymixinB	-	-	100	-	-	-	-
Cefoxitin	-	-	-	-	-	-	60
Linezolid	-	-	-	-	-	100	100
Teicoplanin	-	-	-	-	-	100	100
Vancomycin	-	-	-	-	-	100	100

Table 1: Antibiotic Sensitivity Testing results of various isolates by Kirby Bauer Disc Diffusion Method. (Numbers represent percentage sensitivity)

AST showed sensitivity of E.coli was highest to piperacillin -tazobactam (78%) and meropenem (78%) and least to ofloxacin (26%) while Klebsiella was still highly sensitive (80%) to age old drug Nitrofurantoin. Enterobacter was 100% sensitive to Ofloxacin, piperacillin tazobactam, amoxicillin clavulanic acid and meropenem. 100% Staphylococcus are 100% sensitive to vancomycin, linezolid and teicoplanin.

DISCUSSION: UTI is the most common bacterial infection which is easily curable with apt antibiotic treatment. Local prevalence and sensitivity data of organisms¹⁰ is very helpful in prescribing empirical therapy and guiding future course.

In the present study culture positivity rate is 38% without taking into consideration age and gender differences. Male: Female distribution shows high culture positivity in females which is understandable. In a study by Tantrye et al¹¹ the culture positivity rate is 67% where as in a study by Prakash et al¹² it is 53%. Differences in positivity rate could be due to media selection, technique of growth and local prevalence rate.

The most common organism isolated in our study is E. coli (56.8%) which is comparable to other studies as percentage of E. coli varies from 30% to 85%.^{11, 12 and 13} Other organisms isolated are Klebsiella species (12%), Pseudomonas sp. (12%), Proteus sp. (6.4%), and Staphylococcus aureus (8%) Enterococcus sp, Enterobacter sp. and Acinetobacter sp. The rate of isolation is in sync with other studies^{12, 13} with only exception being isolation of a single Acinetobacter species.

The AST pattern shows alarming trends viz. high resistance to simple sulfa drugs like cotrimoxazole and 1st and 2nd generation cephalosporins against common isolates like E.coli.¹⁴

Quinolones are also showing dwindling sensitivity¹⁵ while aminoglycosides like amikacin and gentamicin are still promising. Cotrimoxazole (trimethoprim sulfmethoxazole) which is considered as standard empirical treatment of acute uncomplicated cystitis⁴ is showing only 40% sensitivity in common pathogens viz. E.coli, Klebsiella which leaves no choice but to prescribe higher antibiotics. Another concerning point is decreased sensitivity of E. coli to meropenem (78%) which is a high end drug for treatment of UTI.

Klebsiella is still 80% sensitive to nitrofurantoin while a study by Alipourfard et al in Kerala shows 32 % sensitivity to it.¹⁶ Also Klebsiella is showing decreased sensitivity to 3rd generation cephalosporins which indicates towards possibility of ESBL production. Pseudomonas is 100% sensitive to piperacillin tazobactam and meropenem both of which are expensive injectables where as a study by Navneeth et al¹⁷ show high resistance to β lactam antibiotics, aminoglycosides and

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fluoroquinolones. Single strain of *Acinetobacter* isolated would be of little less epidemiological value and hence not mentioned in the table but none the less it is sensitive to ofloxacin, gentamycin, amikacin, piperacillin- tazobactam and meropenem.

Gram positive organisms like *Staphylococcus* and *Enterococcus* are still showing 60% and 56% sensitivity to nitrofurantoin which is comparable to a study by Inabo et al¹⁸ which show 67% sensitivity to it. They are 100% sensitive to vancomycin, linezolid and teicoplanin which are reserve drugs for resistant cases.

CONCLUSION: Empirical therapy for UTI in NCR, Ghaziabad can be guided to some extent from the above study. For common pathogens like *E. coli*, *Klebsiella* aminoglycosides, fluoroquinolones and nitrofurantoin can be considered as first choice of antibiotics. For Gram positive organisms nitrofurantoin, amikacin, gentamycin and ampicillin can be used as empirical therapy. A limitation of this study is small population covered. A larger study involving more number of samples would be better for arriving at still better therapy guidelines. Regular updating of such data keeps a tab on epidemiologic profile of bacterial isolates and their trend in response to antibiotics.

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