

# Prevalence of Urinary Tract Infections among Diabetic Patients in a Tertiary Care Centre

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## Abstract

Urinary tract infections are defined as the spectrum of diseases of the genito urinary tract by micro organisms. The risk of urinary tract infection (UTI) is higher in diabetics and the antibiotic resistance of uropathogens have been changing over the past few years. Hence, the study was undertaken to determine the prevalence of various uropathogens and their antibiotic sensitivity pattern in diabetic patients with UTI. **Methods:** Clean voided midstream urine was collected, & inoculated on Blood Agar (BA) and McConckey Agar (MA), and incubated at 37°C overnight for visible growth. **Results:** Out of 120 diabetic patients, 75 patients (30 males and 45 females) were found to have culture positive UTI. The rate of isolation of Klebsiella species (50%) was highest, followed by Escherichia coli (16.6%), Staphylococcus aureus (16.6%), Coagulase negative Staphylococcus (12.5%) and Citrobacter species (4%). All the isolated organisms showed maximum sensitivity to Carbapenems and least susceptibility to Norfloxacin and Nitrofurantoin. **Conclusion:** High blood glucose is the main cause of UTI among diabetics. Therefore, isolation of pathogens in diabetic patients with UTI is important to initiate appropriate antibiotic therapy and to prevent renal complications.

**Keywords:** Diabetics, Urinary tract infections (UTI), Micro organisms, prevalence, susceptible, resistant.

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## INTRODUCTION

Diabetes mellitus (DM) is a worldwide health problem, with an expected prevalence of 593 million by 2035 [2]. Urinary tract infection (UTI) is the most common infection among patients with DM and is responsible for considerable morbidity, particularly if it is unrecognized or untreated [2]. Predisposing factors for UTI include diabetes, elderly, pregnant women, spinal cord injuries, patients with catheters and genitourinary tract abnormalities [3]. UTI should also be suspected when there is a history of recent instrumentation or hospitalization [3]. Also UTI is more prevalent in women than in men because of short urethra and close proximity of urethral meatus to anus [1]. The infection can be acute with classical symptoms of dysuria, increased frequency and urgency, or may present as a severe illness like pyelonephritis and emphysematous cystitis. People with diabetes have dysfunctional bladders which contract poorly, causing retention of urine and thus contributing to recurrent UTI in diabetics. Therefore these patients are also at a higher risk of developing acute pyelonephritis, renal abscess, abnormalities of bladder scarring and pyelitis [4]. Urinary tract infections are caused by uro-pathogens like E.coli, Klebsiella, Pseudomonas, Staphylococcus,

Enterococcus, Coagulase negative Staphylococci (CONS), Serratia and Citrobacter species. The prevalence of DM is increasing worldwide and the emergence of multi-drug-resistant (MDR) strains is escalating. Therefore this study was undertaken to determine the prevalence of bacteria causing urinary tract infection and the AST pattern of the pathogens, among the diabetic patients at Osmania General Hospital, Hyderabad, Telangana.

## MATERIALS & METHODS

A cross-sectional study was conducted at the Department of Microbiology, Osmania General Hospital, Hyderabad, from June 2018 – December 2018. Clearance was taken from Institutional Ethical committee prior to the study. Both male and female diabetic patients of >20 years age with symptoms of UTI who attended the OPD/admitted in wards, were included in the study. Pregnant females and patients with known underlying renal pathology or chronic renal disease, or those who have used antimicrobial therapy during the previous month were excluded from the study. Consent was obtained from those who were willing to participate in the study. History suggestive of UTI (i.e. urgency, dysuria, urinary frequency, loin pain,

and nausea) and other medical disorders, such as hypertension and prostate enlargement (for males) was obtained from the patients and blood glucose levels were measured.

Clean voided midstream urine samples of diabetic patients were collected and processed according to standard microbiological procedures. More than 10<sup>5</sup>CFU/ml of single bacterial species was considered as significant bacteriuria. Isolates were further identified by standard biochemical tests. Symptomatic bacteriuria was defined as significant bacteriuria in addition to symptoms related to UTI, while asymptomatic bacteriuria was defined as significant bacteriuria in the absence of UTI symptoms.

**Antibiotic Susceptibility Testing**

Antibiotic sensitivity testing (AST) was done by modified Kirby-Bauer disk diffusion method on Mueller Hinton Agar (MHA). The antibiotic disks used for testing Gram positive isolates were Norfloxacin (30µg), Nitrofurantoin (30µg), Imipenem (30µg), Piperacillin/Tazobactam (30/10µg), Cefoperazone/Sulbactam (30/10µg), Linezolid (30µg),

and Teicoplanin (30µg). The antibiotic disks used for testing Gram negative isolates were Norfloxacin (30µg), Nitrofurantoin(30µg), Gentamicin(120µg), Mero penem (30µg), Imipenem(30µg), Piperacillin/Tazobactam (30/10µg), Ceftazidime(30µg), and Cefoperazone/Sulbactam (30/10µg). E. coli ATCC® 25922 and E. faecalis ATCC® 29212 were used as control strains. Antimicrobial susceptibility was determined by zone diameters according to CLSI guidelines. Multi-drug resistant (MDR) strains were defined as isolates resistant to ≥2 antimicrobial agents.

**RESULTS**

Out of 120 Diabetic patients, 75(62.5%) patients were found to have culture positive UTI, of which 30 (25%) were males and 45 (37.5%) were females. Rate of Isolation of Klebsiella species was highest (50%), followed by Escherichia coli (16.6%), Staphylococcus aureus (16.6%), Coagulase negative Staphylococci (12.5%) and Citrobacter species (4%). All the isolated organisms showed maximum sensitivity to Carbapenems and least susceptibility to Norfloxacin and Nitrofurantoin.

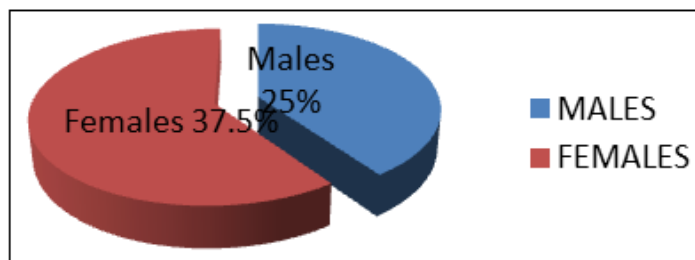


Fig-1: Sex wise distribution of Diabetic patients with UTI

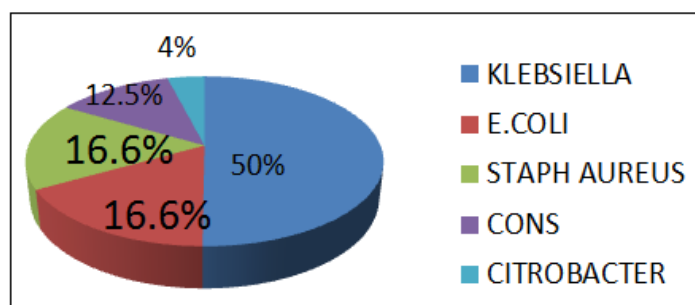


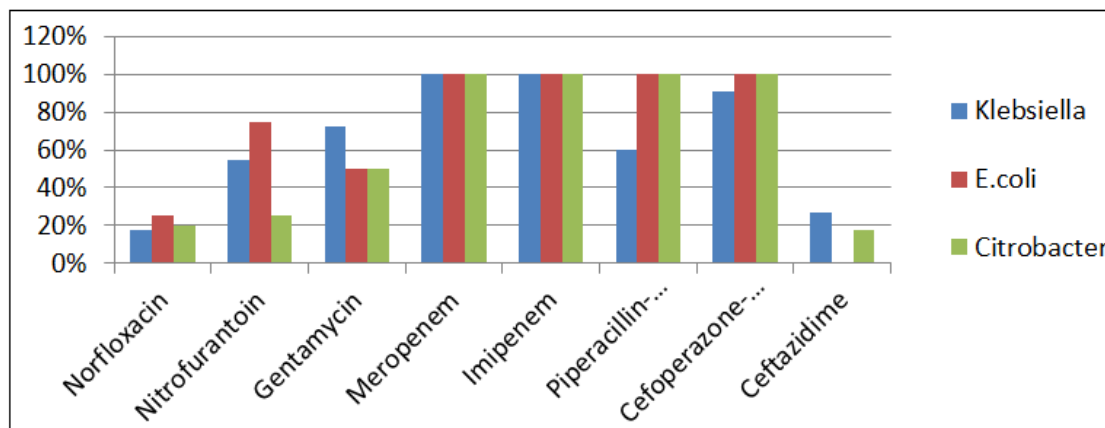
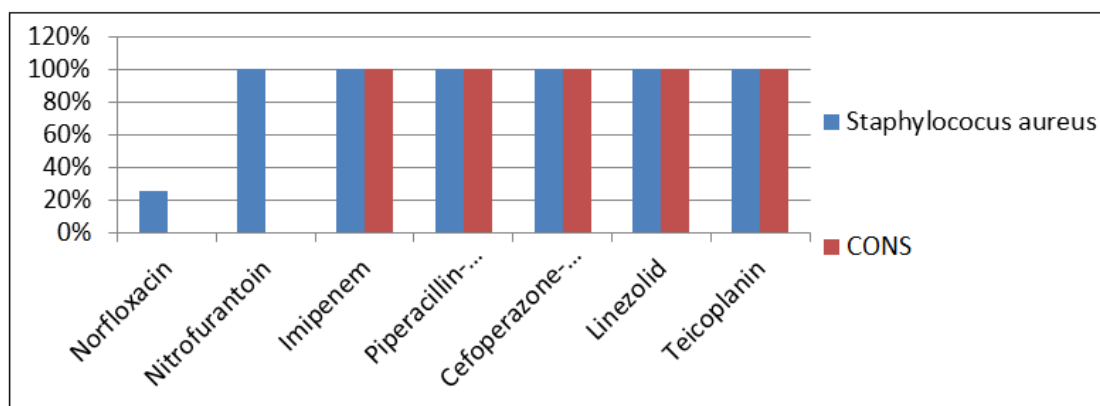
Fig-2: Prevalence of organisms causing UTI in diabetic patients

**Table-1: Antibiotic sensitivity patterns of gram positive bacteria isolated from urine of diabetic patient**

Antibiotics	<i>Staphylococcus aureus</i> (Sensitivity %)	<i>CONS</i> (Sensitivity %)
Norfloxacin	25%	0%
Nitrofurantoin	100%	0%
Imipenem	100%	100%
Piperacillin/Tazobactam	100%	100%
Cefoperazone/Sulbactam	100%	100%
Linezolid	100%	100%
Teicoplanin	100%	100%

**Table-2: Antibiotic sensitivity patterns of gram negative bacteria isolated from urine of diabetic patient**

Antibiotics	<i>Klebsiella species</i> (Sensitivity %)	<i>Escherichia coli</i> (Sensitivity %)	<i>Citrobacter species</i>
Norfloxacin	18%	25%	20%
Nitrofurantoin	54.5%	75%	25%
Gentamicin	72.7%	50%	50%
Meropenem	100%	100%	100%
Imipenem	100%	100%	100%
Piperacillin/Tazobactam	60%	100%	100%
Cefoperazone/Sulbactam	90.9%	100%	100%
Ceftazidime	27%	0%	18%

**Fig-3: Antibiotic sensitivity pattern of Gram negative bacteria isolated from urine of diabetic patients****Fig-4: Antibiotic sensitivity pattern of Gram positive bacteria isolated from urine of diabetic patients**

## DISCUSSION

In the present study, out of 120 diabetic patients, 50 were males and 70 were females. Among them, 75 (62.5%) patients were found to be suffering from UTI, of which 30 (25%) were males and 45 (37.5%) were females. From these results, it is observed that urinary tract infection is more common in females than in males. These results correspond well to the results obtained by Kilpatrick ES, Bloomgarden ZT *et al.*, [4]. In another study done by Ramana BV, Chaudhary A *et al.*, out of 1200 urine samples of diabetic patients, 760 were of females and 440 were of males. The overall prevalence of urinary tract infection in their study was 45% and the prevalence rate was higher in females (46%) than in males (43%) [1, 2].

In the present study, the rate of isolation of *Klebsiella* species was highest (50%), followed by *E. coli* (16.6%), *Staphylococcus aureus* (16.6%), Coagulase negative *Staphylococci* (12.5%) and *Citrobacter* species (4%). These results correlated well with the study done by Chaudary *et al.*, in 2014, where the rate of isolation of *Klebsiella* species and *Staphylococcus aureus* was highest followed by *E. coli* [5].

All the isolated organisms in the present study showed maximum susceptibility to carbapenems (100%) and least susceptibility to Norfloxacin (18%) and Nitrofurantoin (54.5%). From the above results it is

evident that uropathogens are showing increasing resistance to the regular antibiotics like Norfloxacin and Nitrofurantoin, but still remain susceptible to higher antibiotics.

On the other hand, E.coli was the most common organism isolated in studies done by Sushil Kumar Yadav *et al.*, [6] and Dorin DSouza *et al.*, [2]. In these studies, Gram positive cocci like *Staphylococcus aureus* was susceptible to Vancomycin (100%), Linezolid (100%) and Teicoplanin (100%). Gram negative bacilli like E.coli was susceptible to Ampicillin (64%), Imipenem (91%), Meropenem(86%), Nitrofurantoin(55%), and Norfloxacin (64%), whereas *Klebsiella* species were susceptible to Ampicillin(33%), Imipenem(33%), Meropenem (50%), Nitrofurantoin (50%), Norfloxacin (50%), Ceftriaxone(83%), Gentamicin (83%) and Polymyxin B(100%), thus showing multi-drug resistance.

## CONCLUSION

The present study shows that the prevalence of UTI in diabetics is alarming and prolonged usage of antibiotics limits the choice of treatment. The influence of Diabetes and development of UTI has been of concern, because the predisposition of microorganisms involved develops resistance to a routine treatment regimen. Therefore investigation of bacteriuria in diabetics is important for initiating appropriate antibiotic therapy and to prevent renal complications. A

proper antibiotic policy is also necessary in tertiary care hospitals to initiate appropriate empirical therapy and also for effective management of UTIs.

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