Prevalence of Uropathogens and their Antibiotic susceptibility pattern among Diabetic group in a Tertiary care hospital, Tirupathi

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Abstract

Introduction & Objective: Urinary tract infections are most common infections occurred and cause adverse effect in diabetic mellitus patients. Impairment in the immune system, poor metabolism control and incomplete bladder emptying due to autonomic neuropathy may contribute to enhanced risk of urinary tract infection in diabetic patients. The study was undergone to find out the prevalence and incidence of urinary tract infection among diabetic patients according to sex, age and antibiotic sensitivity pattern of isolates obtained.

Materials and Method: Total cases of 250 diabetic patients were studied over a period of 6 months from November to April 2015. Diagnosis of diabetes was made based on the WHO Criteria. Mid stream samples were collected under aseptic precautions and were processed by using standard microbiological procedures. Urine samples were inoculated on Blood agar, MacConkey agar and Nutrient agar and growth characteristics were studies after 24 hrs of incubation. All culture positive isolates were subjected to antibiotic sensitivity by modifies Kirby-Bauers method.

Results & Interpretation: Among 250 samples 100 samples yielded growth. The isolates obtained were Escherichia coli (53%) the dominant isolate followed by Enterococcus faecalis (19%), Staphylococcus epidermidis (10%), Klebsiella Pneumoniae (7%), Pseudomonas aeruginosa (4%), Staphylococcus aureus (3%), Proteus vulgaris (2%) Acinetobacter species (2%). The isolates were highly sensitive to, Amikacin, Imipenem, Nitrofurantoin and Pipercillin -Tazobactum.

Conclusions: Diabetic patients are at high risk of development of UTI. Continued surveillance of resistance rates among uropathogens is needed to ensure appropriate recommendation for the treatment of these infections.

Keywords: Urinary tract infection, Antibiotic resistance, Diabetic uropathogens.

Introduction

The urinary bladder is normally a sterile environment. Urinary tract infection (UTI) is reported as one of the most common infectious diseases in humans and, as expected, the most common urological disease by far.[1,2] Bacteria have the ability to survive in urine and colonize all parts of the urinary tract including the urethra, ureters, bladder, and kidney. Recurrent UTI and chronic UTI are of special concern, especially in vulnerable populations such as the elderly, diabetics, and infants.[3,4]

Diabetes is one of the common health problems of mankind, its prevalence and incidence markedly rises with advancing age. Urinary tract infections are thought to be more severe and complicated in diabetics compared to normal patients. The biological mechanism of UTI among diabetic patients remained unclear but is expected to be the immune mechanism responsible for the quality of glycemic control. Asymptomatic UTI is more common in diabetic patients but bacteriuria is more common which leads to damage of kidney and renal failure.[5] Recent studies from Europe revealed that prevalence of UTI in women with diabetes are more than women without diabetes. The risk factors associated with UTI are claimed to be sexual intercourse, age, duration of diabetes, glycemic control and complications of diabetes.[6] In addition autonomic neuropathy in diabetes mellitus impairs bladder emptying which subsequently results in UTI.[7,8] Even the distribution of pathogenic flora is changing in UTI; Escherichia coli remain the most frequent cause in diabetics. The other organisms commonly encountered are klebsiella, Enterococci and group B streptococci.[9]

Appropriate drug must be chosen by culturing and antibiotic sensitivity testing; proper antic antibiotic along with glycemic control can eradicate the infection. The study was undergone to determine the prevalence and susceptibility pattern of the isolates in diabetic patients.

Materials and Method

A total of 250 diabetic patients were studies for a period of 6 months from November to April 2015, the diagnosis of diabetes was made based on the WHO criteria.[10] Midstream urine samples were collected from the patients after giving proper guidelines. The urine samples were immediately transported to the microbiology department. If the urine specimen was found to be contaminated with normal flora of the vagina and urethra, the subject was asked to submit another sample for analysis. Samples were processed using the following standard microbiological procedure. Urine cultures were done by inoculating urine samples on blood agar and MacConkey agar plates using a calibrated loop (0.001ml) and incubated at 37^0C for 18-24 hours. Those culture reports were considered

positive who had colony forming units more than 10^5/ml of voided urine. A pure culture of Staphylococcus aureus was considered to be significant regardless of the number of CFUs. The presence of yeast in any number was also considered to be significant. The pathogens were isolated and biochemical tests were done for identifying the species of the pathogens. Antimicrobial sensitivity was done by Kirby-Bauer disc diffusion method. A diagnosis of UTI was made if the urine cultures had 10^3 to 10^5 colony forming units (CFU/ML) of single potential pathogens or two potential pathogens.

Results

The present study was done in the Department of Microbiology, Sri Venkateswara Institute of Medical Sciences, Tirupathi. A total of 250 urine samples were collected out of which females are 131 and males 119 respectively.

Table 1: Culture positivity in studied population

S. No	Gender	Positive isolates	Negative isolates	Number of samples
1	Male	37	82	119
2	Female	63	68	131
Total		100	150	250
p-value =0.009 Chi square value =6.816				

Table 1 shows that out of 250 urine samples 100 samples yielded growth (40%), and the prevalence rate was higher in females (63%) than males (37%).

Table 2: Incidence of UTI isolates in diabetic patients

Organisms isolated	Number	Percentage
Escherichia coli	53	53%
Enterococcus faecalis	19	19%
Klebsiella pneumoniae	07	7%
Staphylococcus epidermidis	10	10%
Pseudomonas aeruginosa	04	04%
Staphylococcus aureus	03	3%
Proteus vulgaris	02	02%
Acinetobacter spp	02	02%
Total	100	100%

Table 2 depicts that out of 100 isolates, 68 isolates were Gram negative bacilli and 32 were Gram positive cocci. Among 68 Gram negative bacilli, Escherichia coli 53 (77.94%) remained dominant organism followed by Klebsiella pneumoniae 7 (10.29%), Pseudomonas aeruginosa 4 (5.88%) Proteus vulgaris 2 (2.94%), and Acinetobacter species 2 (2.49 %). Among 100 isolates 32 isolates were gram positive cocci, Enterococcus 19 (59.37%) was predominate isolate followed by Staphylococcus epidermidis10 (31.25%), and Staphylococcus aureus3 (9.37%).

Table 3: Antibiotic susceptibility pattern of gram negative bacteria to various antibiotics

S. No	Antibiotic	Escherichia coli (53)	Klebsiella pneumoniae (07)	Proteus vulgaris (02)	Pseudomonas aeruginosa (04)	Acinetobacter spp (02)
1	AK	9% (5)	42.8%(3)	50%(1)	75%(3)	50 % (1)
2	AMC	71% (38)	100% (7)	50%(1)	75%(3)	50% (1)
3	AMP	88 % (47)	100% (7)	50% (1)	75%(3)	50% (1)
4	CFS	9.4% (5)	100% (7)	50% (1)	50% (2)	50% (
5	CXT	69% (37)	14% (1)	50% (1)	50% (2)	50% (1)
6	CIP	71% (38)	42.8% (3)	0	50% (2)	50% (1)
7	COT	49% (26)	42.8% (3)	100% (2)	100% (4)	100% (2)
8	G	15% (8)	0	0	25% (1)	50% (1)
9	PET	7% (4)	0	100% (2)	25% (1)	50% (1)
10	IMP	3% (2)	14.2% (1)	0	25% (1)	0% (0)
11	NFT	1.8% (1)	0	0	0	50% (1)
12	NA	88% (47)	100 (7)	100% (2)	100 (4)	50% (1)

Abbreviation: AK: Amikacin, AMC: Amoxyclav, AMP: Ampicillin, CFS: Cefaperazone--Sulbactum, CXT: Cefoxitime, COT: Co-Trimoxazole, G: Gentamicin, PET: Piperacillin -Tazobactum, IMP: Imipenem, NFT: Nitrofurantoin, NA: Nalidixic acid

Table 3 shows that Gram negative bacilli were found to be highly resistant to Nalidixic acid (84.5%), Co-trimoxazole (81.8%), Ampicillin (77.1%), and Amoxyclav (74.3%). Escherichia coli the dominant organism among gram negative group, showed maximum resistance to Nalidixic acid (88%), Ampicillin (88%) and Amoxyclav (71%). Maximum strains of Escherichia coli were sensitive to Imipenem and Amikacin.

Table 4: Resistance pattern of Enterococcus faecalis to various antibiotics

S. No	Antibiotics	Enterococci (19)
1	CFS	15.7% (3)
2	AMP	31.5% (6)
3	CL	15.7% (3)
4	CIP	68.4% (13)
5	E	10.5% (2)
6	LZ	15.7% (3)
7	P	26.3% (5)
8	V	15.7%(3)
9	G	5.2% (1)

Abbreviations: CFS: Cefaperazone-Sulbactum, AMP: Ampicillin, CL: Clindamycin, E: Erythromycin, LZ: Linezolid, P: Pencillin, V: Vancomycin, G:Gentamycin, CIP: Ciprofloxacin, G: Gentamicin.

Table 5: Resistance pattern of gram positive organisms to various antibiotics

S. No	Antibiotics	Staphylococcus aureus (03)	Staphylococcus epidermidis (10)
1	AMP	66.66%(2)	100% (10)
2	I	0 (0)	10% (1)
2	CFT	33% (1)	30% (3)
3	CIP	33% (1)	30% (3)
4	CL	33% (1)	30% (3)
5	COT	33% (1)	30% (3)
6	E	33% (1)	40% (4)
7	LZ	0 (0)	0 (0)
8	P	33% (1)	90% (9)
9	V	0 (0)	0 (0)

Abbreviations: AMP: Ampicillin, CFS: Cefaperazone-Sulbactum, COT; Co- Trimoxazole, I: Imipenam, CL: Clindamycin, E: Erythromycin, LZ: Linezolid, P: Pencillin, V: Vancomycin.

Among gram positive cocci showed highest resistance was noted to Cefaperazone- Sulbactum (100%), Ampicillin (66%), and Pencillin (33%). Enterococci showed maximum resistance to Ciprofloxacin (68%), Ampicillin (31.7%) and Pencillin (26.3%).

Discussion

In this study the overall prevalence of UTI in diabetic patients was 40.4% which is in accordance with the other author's findings.[7] The present study states that the incidence of UTI was found to be high in females when compared to males and was very similar to the study of previous author's findings.[9] Escherichia coli was the major isolate found in this study followed by Enterococci, staphylococcus epidermidis, klebsiella, pseudomonas, staphylococcus aureus, and proteus. This study coincides with the other researchers studies which have showed that Escherichia coli was the predominant isolate of UTI.[9,11,12,13] In our study only 59.37% isolates were Enterococcus which was almost similar to other studies.[7,14]

Gram negative bacilli were found to be highly resistant to Ampicillin, Amoxyclav, Cotrimoxazole and Ciprofloxacin which was similar to previous author study.[15] In our study Escherichia coli showed maximum resistance to Ampicillin (88%) and maximum strains of Escherichia coli were sensitive to Imipenem and Amikacin.

Gram positive cocci showed highest resistance to Cefaperazone- Sulbactum (100%), Ampicillin (66%), and Pencillin (33%). Enterococci showed maximum resistance to Ciprofloxacin (68%), Ampicillin (31.7%) and Pencillin (26.3%).

The antibiotic susceptibility testing of isolates showed moderate to high level resistance to various antibiotics tested which was similar to those reported in other studies.

As this study was only limited to the isolation of uropathogens in diabetic patients only so we could not study the overall uropathogens in general urinary tract infections.

Conclusion

The study gives an idea on the incidence and their drug resistance pattern of uropathogens in diabetic patients. Escherichia coli remain as dominant bacilli among uropathogens. After studying the antibiotic sensitivity pattern it was realized that Escherichia coli strains were most sensitive to Imipenem and Amikacin and showed maximum resistance to Ampicillin and Nalidixic acid. Diabetes mellitus is a high risk factor in causing Urinary tract infection, early diagnosis and treatment should be prompt to prevent its complications. Antibiotic surveillance of uropathogens must be known to the clinicians for empirical and definitive treatment among diabetic group to prevent resistant strains.

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