Study of Prevalence of Uropathogens and Antibiotic Sensitivity Pattern in Diabetic Patients Suffering From Urinary Tract Infection in a Tertiary Care Teaching Hospital.

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ABSTRACT

Background: Diabetes Mellitus is a major health problem of today's world and its prevalence is riding day by day. Urinary tract infection is its common complication. Antibiotic resistance against various uropathogens is also increasing day by day. Therefore, this prospective was carried out to know the prevalence of culture positive Urinary Tract Infection in diabetic patients and to find out the pattern of antibiotic sensitivity. **Methods:** Around 430 diabetic patients with urinary tract infections confirmed from Microbiology department from Oct, 2012 to February, 2014 were enrolled. **Results:** Out of 430 patients, 302 urine specimens (Male n=140, 46.4%) and (Females n=162, 53.5%) were found to be culture positive. The overall prevalence of urinary tract infection was 70.2% higher in females (53.5%) than males (46.4%). Among the 302 isolates, 256 belongs to gram negative bacilli, 46 were gram positive cocci. In gram negative bacilli, most of the isolates160 (62.3%) were E.coli, and in gram positive cocci, Enterococci (55%) were predominately found. Imipenem was found sensitive for both Gram negative bacilli as well as Gram positive cocci. **Conclusion:** Diabetics with UTI found with high female/male ratio. Escherichia-coli was most common organism followed by klebsiella, and pseudomonas. Most of the urinary isolates were sensitive to Imipenem, Meropenem, ceftriaxone, whereas resistance was high for Amikacin.

Keywords: Urinary Tract Infections, Diabetes Mellitus, E. Coli, Klebsiella and Pseudomonas

INTRODUCTION

As we know the prevalence of diabetes is rising all over the world due to population growth, aging, urbanization and an increase of Obesity and physical inactivity. Diabetes mellitus is an important public health priority requiring urgent preventive action. In 2020 India is going to be the capital of diabetes as it is reported that 1 out of 4 individuals will be an Indian diabetic in the world.[1] The prevalence of Diabetes mellitus is rising day by day. The prevalence of Intermediate Glucose Tolerance (IGT) is thought to be around 8.7 per cent in urban areas and 7.9 per cent in rural areas, although this estimate may be too high. It is thought that around 35 per cent of IGT sufferers go on to develop type 2 diabetes, so India is genuinely facing a health care crisis.[2]

As the disease is associated with so many complications, Urinary Tract Infections (UTI) is one of them and also one of the common reasons of diabetic patients visiting the hospitals. It has been estimated that globally symptomatic UTIs result in as many as 7 million visits to outpatient clinics, 1 million visits to emergency departments and 100,000 hospitalizations annually.[3]

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Urinary Tract Infections is one of the important causes of patient visiting to the hospitals. Urinary tract infections are frequently found in diabetic patients, or may take a more severe course.[4] Diabetic patients are more prone to Urinary Tract Infection, may be because of a combination of host and local risk factors.[5,6] Alteration in Chemical composition of urine in diabetes mellitus can alter the ability of urine and support the growth of microorganisms. Furthermore, autonomic neuropathy in diabetes mellitus impairs bladder emptying and subsequent urological manipulation pre-dispose to UTI.[5] The difference is more pronounced in women both in symptomatic infections and asymptomatic bacteriuria. Among the various uropathogens responsible for Urinary Tract Infections, Escherichia coli (E. coli) continues to be the main etiological agent of urinary tract infection.[5,7,8]. Besides E. coli, other organisms isolated being Klebsiella pneumonia, Proteus mirabilis and Pseudomonas aeruginosa.[5,9]

Due to the emergence of multidrug resistant (MDR) uropathogenic strains, the choice of antimicrobial agent is restricted.[10] With the improper and irrational use of many antibiotics resulted in the occurrence of antimicrobial resistance, which became a major health problem worldwide.[11] At present, the most effective oral antibiotics used in UTI are the 3rd generation cephalosporins.[4] The administration of drugs like doxycycline or cotrimoxazole is not recommended in empiric therapy because of the high resistance

rate of E. coli, but even the choice of amoxicillin/clavulanic acid or a fluoroquinolone is questionable for empiric therapy in severe infections.[3]

Therefore this study was carried out to know the prevalence of culture positive Urinary Tract Infection in diabetic patients and to find out the causative organisms and pattern of antibiotic sensitivity.

MATERIALS AND METHODS

This prospective, prevalence study was carried out to know the prevalence of culture positive Urinary Tract Infection in diabetic patients and to find out the causative organisms and pattern of antibiotic sensitivity. Around 430 patients with documented urinary tract infection were enrolled on the basis of inclusion and exclusion criteria. The patients included in our study were diabetic patients with culture positive urine confirmed by Microbiology department attending both outpatients and inpatient's Medicine department from Oct, 2012 to February, 2014. Any previous history of antibiotic usage within 15 days of the study was excluded from our study.

This study was conducted by the department of Microbiology in collaboration with Medicine and Biochemistry department at Gujrat Adani Institute of Medical Sciences, Bhuj, Gujarat.

A written informed was taken from each patient before the commencement of the study. Approval from Institutional Ethical Committee was also granted before starting the study.

Mid-stream urine sample was collected using full aseptic precaution. The organisms were isolated and identified by standard biochemical tests.[12]

The antibiotic susceptibility of the isolates was undertaken by the disc diffusion assay on the Muller Hinton agar and Blood agar media by modified Kirby-Bauer method.[13] The antibiotics tested were Amikacin, Ciprofloxacin, Ceftriaxone, Piperacillin/tazobactum, Meropenem, Imipenem, and Levofloxacin.

RESULTS

Out of 430 patients, 302 urine specimens (Male n=140, 46.4%) and (Females n=162, 53.5%) were found to be culture positive. The overall prevalence of urinary tract infection was 70.2% and the prevalence rate was found to be higher in females (53.5%) than males (46.4%) [Table 1].

Table 1: Demographic details of culture positive Diabetic patients (n=302).

Age Group	Male	Female	Total
20-40	25	28	53
41-60	74	88	162
61-80	41	46	87
Total	140 (46.4%)	162 (53.5%)	302

A total of 302 pathogens were isolated among all the patients with significant UTI.

Among the 302 isolates, 256 belongs to gram negative bacilli, 46 were gram positive cocci. Among the 256 gram negative bacilli, 160 (62.3%) were E.coli, 40 (15.8%) were Klebsiella, 34 (13.3%) were Pseudomonas and 15 (5.9%) were Proteus spp. Enterobacter spp. and Citrobacter spp. were present in only less than 3% of the patients. Among the gram positive cocci Enterococci (55%) were predominate followed by coagulase-negative Staphylococcus (28%), Beta-haemolytic Streptococci (12%), and Staphylococcus aureus (5%) [Table 2].

Table 2: Pathogens isolated from Urine sample of diabetic patients

Bacteria	Isolates	Urine culture Positive
Gram Negative (n=256, 84.7%)	E. coli sp	160 (62.3%)
	Proteus mirabilis	15 (5.9%)
	Pseudomonas aeruginosa	34 (13.3%)
	Klebsiella sp	40 (15.8%)
	Citrobacter sp	3 (1.1%)
	Enterobacter	4(1.5 %)
Gram Positive (n=46,15.2%)	Enterococci	25 (54.3%)
	Coagulase-negative Staphylococcus	12 (26%)
	Beta-hemolytic Streptococci	5 (10.8%)
	Staphylococcus aureus	4 (8.6%)
Total		302

The antibiotic sensitivity patterns of the isolates to various antimicrobial agents are shown in Table 3. Gram negative bacilli were found to be highly sensitive to Imipenem (92%), followed by Meropenem (88%) piperacillin / tazobactum (82%), Ceftriaxone (88%), Levofloxacin (88%), whereas Gram positive cocci were highly sensitive to

Imipenem (56%), followed by Ceftriaxone (55%), and least sensitive to Amikacin (24%).

Amikacin was found to be more sensitive in gram negative bacilli than gram positive cocci to (45 vs 24%). Ciprofloxacin sensitivity against Gram positive cocci and gram negative bacilli was found to be similar with slightly more sensitivity towards gram negative bacilli (38 vs 32%) [Table 3].

Levofloxacin found to be more sensitive to gram negative bacilli (72%) than gram positive cocci (25%). The similar pattern was found in case of Piperacillin /tazobactum (88 vs 46%), Ceftriaxone (75 vs 55%), Imipenem (92 vs 56%) and Meropenem (88 vs 45%) [Table 3].

Table 3: Susceptibility percentage of the UTI isolates.

Organism	Gram Negative Bacilli (Value in %)(n=256, 84.7%)		Gram Positive Cocci (Value in %)(n=46, 15.2%)	
	Sensitivity	Resistant	Sensitivity	Resistant
Amikacin	45	55	24	76
Ciprofloxacin	38	62	32	68
Levofloxacin	72	28	25	75
Piperacillin /tazobactum	88	12	46	54
Ceftriaxone	75	25	55	45
Imipenem	92	8	56	44
Meropenem	88	12	45	55

DISCUSSION

The present prospective study conducted on Type 2 Diabetic patients aged 20-80 years suffering from Urinary Tract Infections reveals the antibiotic resistant profile of the mostcommon UTI causing organisms.

The overall prevalence of urinary tract infection was 70.2% and the prevalence rate was found to be higher in females (53.5%) than males (46.4%) [Table 1]. Majority of the patients belongs to 41-60 age group. In comparison to other studies, we founded higher prevalence of urinary tract infection, may be because of the higher population of rural patients attending the hospital. Also prevalence was found to be higher in females than male, this was well supported by studies conducted by other researchers.[9,14-16]

The predominant number of pathogens isolated in our study were gram negative bacilli rather than gram positive pathogens which is also supported by other Adeyeba et al.[17]

In our study, Escherichia coli (62.3%) was most common organism isolated followed by klebsiella, pseudomonas and Proteus. This was in accordance with the study conducted by Simkhada R.[14] [Table 2].

Main uropathogen isolated was E. Coli (62.3%). This was in accordance with similar study conducted by Bonadio M et al. showed that 54.7% of urinary tract infections were caused by E.coli.[8]. Similar results were also showed by Goswami R. and they found that E. coli was the most commonly grown organism (64.3%).[18,19] Similar findings were observed by Ramana and Chaudhary.[5]

Our study showed that Amikacin was seen resistant in most of the cases of gram negative bacilli infections. This finding was contradictory to other previous studies showed that Amikacin was found to be sensitive in most of the cases. Ciprofloxacin

was found sensitive in only 38% of gram negative bacilli infections, contradictory to study conducted by Ramana and Chaudhury, who showed Ciprofloxacin was sensitive in 65% cases.[5] Sensitivity of 3rd generation Cephalosporin Ceftriaxone and Levofloxacin was in accordance to previous studies showing good response against gram negative bacilli infections.[4]. Imipenem and Meropenem were found to be highly sensitive against gram negative infection as well supported by previous studies.

Only drugs which have showed good activity against gram positive cocci were Imipenem, Ceftriaxone and Meropenem.

Conclusion

Diabetic patients with Urinary Tract Infections found with high prevalence in females than male. Escherichia-coli was most common organism isolated followed by klebsiella, and pseudomonas. Most of the urinary isolates were sensitive to Imipenem, Meropenem, ceftriaxone, whereas resistance was high for Amikacin. Antibiotic resistance is rising day by day due to improper utilization of antibiotics and we are also aware of the fact that the rate of antibiotic resistance is higher than the rate of new antibiotic development, therefore physicians are required to understand this global problem and adhere to proper antibiotic prescribing policy.

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