

CLINICAL PROFILE OF URINARY TRACT INFECTION IN TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: Urinary tract infections (UTIs) are common in type 2 diabetes leading to severe complications ranging from dysuria to pyelonephritis. Several different mechanisms may contribute to the higher frequency of UTI. The aims of this study were to determine the prevalence of urinary tract infection, the clinical features, the causative pathogens and their antimicrobial pattern in type 2 DM subjects.

Material & Methods: A total of 540 (M: F 194: 346) consecutive type 2 DM subjects were studied over a period of one year from May 2013 to April 2014. Subjects who received antimicrobial drugs during the past one month or documented urinary tract infection in the previous six months, pregnant women, and those with renal failure were excluded from the study.

Results: A significant colony count was seen in 120 (22.22%) patients and an insignificant count in 78 (14.44%) patients. Women (70%) had a significantly higher prevalence of UTI than men (30%). The common presenting symptoms were fever (89.2%), increased frequency of micturition (77.5%) and dysuria (81%). Gram negative bacilli were the commonest organism isolated from 88 patients in this study. Escherichia coli were the most commonly found organisms. Gram negative bacilli were found to be highly sensitive to ciprofloxacin, ceftriaxone, cefotaxime and Sulbactam/cefoperazone.

Conclusions: UTIs were found significantly higher in women than in men in diabetic patients with E.coli being the main causative organism. Gram negative bacilli were sensitive to ciprofloxacin, ceftriaxone, cefotaxime and Sulbactam/cefoperazone.

KEYWORDS: Type 2 Diabetes, Urinary Tract Infections, Prevalence, Causative Organisms, Antimicrobial Pattern

INTRODUCTION

Type 2 diabetes mellitus (DM) is a chronic, progressive metabolic disorder resulting from the loss of early insulin secretion and development of insulin resistance. Type 2 diabetes is also considered an immune compromised state and is a known risk factor for certain infectious diseases¹

Urinary tract infections (UTIs) are the most common type of bacterial infections. ²Patients with type 2 DM have a higher prevalence of asymptomatic bacteriuria (ASB) and incidence of UTIs and other infections compared with patients without DM. The prevalence of ASB in women is as high as 26% with DM compared with 6% in those without DM³

Several different mechanisms may contribute to the higher frequency of UTI and related complications among

diabetic patients, including immune function impairments, ¹dysfunctional bladder emptying related to autonomic neuropathy⁴ and higher glucose levels in the urine which may facilitate the growth of pathogenic organisms⁵

Various risk factors such as sexual intercourse, age, duration of diabetes, glycemic control, and complications of diabetes are associated with UTI⁶

The aims of this study were to determine the prevalence of urinary tract infection, the clinical features, the causative pathogens and their antimicrobial pattern in type 2 DM subjects.

MATERIALS AND METHODS

A total of 120 (M: F 84: 36) consecutive type 2 DM subjects were studied over a period of one year from May 2013 to April 2014.

Demography, anthropometry, and the duration of diabetes were recorded and the body mass index (BMI) (kg/m^2) was calculated using height and weight measurements. Diagnosis of diabetes was made based on the WHO criteria. Subjects who received antimicrobial drugs during the past one month or documented urinary tract infection in the previous six months, pregnant women, and those with renal failure were excluded from the study. Patients who were not willing to participate in the study were also excluded from the study. Protocol and consent forms were approved by the institutional ethics committee. All patients provided written informed consent.

Midstream urine samples were collected from the patients after giving proper guidelines. The urine samples were immediately transported to the central laboratory. 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 procedures: smears for Gram's staining, culture for morphology, biochemical tests for identifying the species of the pathogens, and antimicrobial sensitivity.

A diagnosis of UTI was made if the urine cultures had $>10^3$ to $>10^5$ colony forming units (CFUs/ml) of a single potential pathogen or two potential pathogens. 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 significant⁷

RESULTS

From 1st May 2013 to 30th April 2014, a total of 540 patients were screened for the study. One hundred and twenty (22.22%) patients showed a significant colony count whereas 78 (14.44%) subjects had an insignificant colony count. No growth was seen in 315 (58.33%) specimens; there were 45 (8.33%) improperly collected specimens (if the colony count was $>10^5$ CFU/ml with three different organisms). Polymicrobial urinary tract infections were seen in 6 (1.11%) cases. Symptomatic UTI was noted in 67 (12.41%) subjects. For the analysis purpose, only 120 patients with the significant colony count were taken as UTI. Of the patients, 36 (30%) were males and 84 (70%) females (Table 1). The mean age of patients was 51.1 years. The ages of the patients ranged from 18 years to 86 years with no significant difference between males and females as shown in Table 2.

Table 1: Sex Distribution of UTI

	Total Number of pts (N)	Percentage (%)
Total (n=540)	120	22.22
Men (n=194)	36	6.6
Women (n=346)	84	15.5

Table 2 shows the background characteristics of patients with UTI. The prevalence of UTI was not very marked until the age of 40 years and thereafter, a significant increase was seen in both men and women. It is observed that the incidence of UTI increased with increasing duration of diabetes.

Table 2: Background Characteristics

	N	%
Age Group		
<20 years	2	1.6
20-30 years	6	5
30-40 years	24	20
40-50 years	37	30.83
>50 years	51	42.5
Presenting Symptoms		
Fever	107	89.2
Frequency of micturition	93	77.5
Dysuria	81	67.5
Pain abdomen	23	19.16
Vomiting	21	17.5
Non-specific symptom	47	39.2
Signs		
Suprapubic tenderness	21	17.5
Renal angle tenderness	17	14.2

Among the specimens containing Candida, 15(83.3%) were candida saprophytes and 3 (16.7%) were Candida albicans.

Table 3: Causative Agent for UTI in Type 2 DM

	Gram Negative Bacilli	Gram Positive Cocci
Gram negative bacilli:88 Gram positive cocci: 31 candida spp: 18	E.coli: 69 Klebsiella:14 Pseudomonas: 3 Miscellaneous: 2 (Citrobacter, Enterobacter)	Enterococci: 19 Coagulase negative staphylococcus: 6 β -hemolytic Streptococci: 3

Table 4: Antimicrobial Pattern of Gram Positive Cocci and Gram Negative Bacilli

Antimicrobial Agent	Gram Positive Coco	Gram Negative Bacilli
Amikacin	9	19
Nitrofurantoin	13	17
Co-trimoxazole	5	9
Ciprofloxacin	11	32
Ofloxacin	15	16
Ampicillin	1	2
Cefotaxime	14	24
Ceftriaxone	21	27
Ceftazidime	16	18
Sulbactam/cefoperazone	27	21

Table 5: Predisposing /Precipitating Factor

Predisposing Condition	N (Percentage)
Calculi	14 (11.7)
Enlarged prostate	5 (4.2)
Poor perineal hygiene	4 (3.3)
Phimosis	1 (0.8)

Table 5: Contd.,

Prolapse	3 (2.5)
Vulvo-vaginal infection	7 (5.8)
History of catheterization/instrumentation	9 (7.5)

DISCUSSIONS

The present study shows significantly higher incidence of UTI in females than in male type 2 diabetic patients. Similar findings have been observed in various epidemiological studies^{8,9}. The high incidence of infection in the urinary tract of diabetic women may be due to number of microorganisms located in the vagina⁹

UTI is multifactorial in patients with diabetes and are related to various diabetes associated risk factors such as age, duration of diabetes, presence of obesity and glycemic control. The present study shows high incidence of UTI in the age group beyond 50 years (42.50%) and duration of diabetes more than 10 years (47.5%). Female sex, older age, proteinuria, a lower body mass index and a history of UTI were identified as important risk factors for UTI in a study from Netherlands¹⁰

The most common presenting features for which patients consulted the physicians were fever (89.17%), increased frequency of micturition (77.50%) and dysuria (67.50%). Physical signs were present only in 22.5% cases only. Suprapubic (17.50%) and renal angle (14.17%) tenderness were the most common clinical signs were observed.

Evidence from bacteriological study shows that the gram negative enteric organisms commonly cause UTI such as *E.coli*, *Klebsiella* spp, and the *Proteus* saprophytes.¹¹ The predominant number of pathogens isolated in our study were also gram negative bacilli. *E.coli* was isolated from 57.50% of the subjects, followed by *Klebsiella* (11.6%), and *Pseudomonas* (2.5%). In another study from India, it was observed that the *E.coli* was the most commonly grown organism (64.3%) followed by *Staphylococcus aureus* (21.4%) and *Klebsiella pneumonia* (14.3%)¹². It has been found in a study that there is higher tendency of *E.coli* adherence in diabetic patients with poor glycemic control^{13,14}

UTIs due to Enterococci are quite common and could be a consequence of nosocomial infection. *Enterococcus faecalis* was found to be the cause of UTI in hospital admitted patients. Lloyds et al have shown that Enterococcal species accounted for 35% of UTIs.¹⁵ Our results showed that 15.83% of subjects had Enterococci spp. among gram positive organisms.

Gram positive cocci play a lesser role in UTIs. Coagulase negative *Staphylococcus* accounted for 10-15% of acute symptomatic UTIs in young females.¹⁶ In our study also, these pathogens were isolated in a very few patients.

Due to limited resources, only few antibiotics were included for drug sensitivity testing. We found that sulbactam/cefoperzone were highly sensitive to both gram negative bacilli and gram positive cocci.

CONCLUSIONS

UTI was more common in women with type 2 DM than in men. Higher risk of UTI was seen in older people, longer duration of diabetes, and poor glycemic control. Gram negative pathogens were commonly isolated and were highly sensitive to sulbactam/cefoperzone combination.

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