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Analysis of Microbiological Profile and Antibiotic Sensitivity Pattern Among Diabetic Patients with UTI

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Background: The prevalence of urinary tract infections in diabetic women is higher than in men. Urinary tract infections make it difficult to control blood sugar in diabetic patients, which increases the need for blood sugar monitoring, reduces the quality of life, and imposes significant treatment costs on the patient. Hence; the present study was conducted for analyzing microbiological profile and antibiotic sensitivity pattern among diabetic patients with UTI.

Materials & methods: A total of 100 patients with presence of type 2 diabetes mellitus were enrolled. Complete demographic and clinical details of all the patients was obtained. The presence of bacteria was considered diagnostic indicators for urinary tract infections. The pathogen was identified using urine culture investigation, which was limited to individuals whose urine microscopy revealed infection. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Results: UTI was seen in 30 percent of the patients. Escherichia coli was the predominant micro-organism found to be present in 56.67 percent of the patients. *Klebsiella* species, *Enterobacter* species, *Staphylococcus* species and *Pseudomonas aeruginosa* was present in 13.33 percent, 13.33 percent, 10 percent and 6.67 percent of the patients respectively. *E.coli* was mainly susceptible to Cefotaxime, Cefuroxime, Amikacin, ciprofloxacin and meropenem. Similar pattern was recorded for *Klebsiella* and *Enterobacter*. *Staphylococcus* species was susceptible to cefotaxime, ciprofloxacin and Nalidixic acid. Pseudomonas species was susceptible to Cefuroxime.

Conclusion: UTI is found to be affecting significant proportion of type 2 diabetic patients. Hence; adequate knowledge of the microbiological profile and antibiotic sensitivity patterns helps early treatment planning and reducing the morbidity associated with it.

Key words: Microbiological Profile, Antibiotic sensitivity, Diabetic

Introduction

Type 2 diabetes mellitus is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production.[1] Patients with type 2 diabetes mellitus are at increased risk of infections, with the urinary tract being the most frequent infection site.[2] Various impairments in the immune system, in addition to poor metabolic control of diabetes, and incomplete bladder emptying due to autonomic neuropathy may all contribute in the pathogenesis of urinary tract infections (UTI) in diabetic patients.[3, 4] Strict glycemic control in DM may help in decreasing the incidence of UTI, further the periodic screening and identification of the causative agent and proper management according to susceptibility pattern may decrease the associated complications and mortality. The emergence of UTIs caused by drug resistant strains is mounting both in community and healthcare setups and the situation is challenging in country like India due to irrational use of antibiotics.[5-8]

The prevalence of urinary tract infections in women is higher than in men, which may be due to the

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specific structure of the short urinary tract, the shortness of the urethra, and its proximity to the anus in women. Urinary tract infections make it difficult to control blood sugar in diabetic patients, which increases the need for blood sugar monitoring, reduces the quality of life, and imposes significant treatment costs on the patient.[7- 9] Hence; the present study was conducted for analyzing microbiological profile and antibiotic sensitivity pattern among diabetic patients with UTI.

Materials & methods

The present study was conducted for analyzing microbiological profile and antibiotic sensitivity pattern among diabetic patients with UTI. A total of 100 patients with presence of type 2 diabetes mellitus were enrolled. Complete demographic and clinical details of all the patients was obtained. Every patient had a 5-ml urine sample taken midstream to check for UTIs. White blood count (WBC) >5 per high power field (HPF), positive leukocyte esterase, and the presence of bacteria were considered diagnostic indicators for urinary tract infections. The pathogen was identified using urine culture investigation, which was limited to individuals whose urine microscopy revealed infection. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Results

A total of 100 type 2 diabetic patients were analyzed. Mean age of the patients was 45.3 years. Out of these 100 patients, UTI was seen in 30 percent of the patients. Escherichia coli was the predominant micro-organism found to be present in 56.67 percent of the patients. *Klebsiella* species, *Enterobacter* species, *Staphylococcus* species and *Pseudomonas aeruginosa* was present in 13.33 percent, 13.33 percent, 10 percent and 6.67 percent of the patients respectively. *Escherichia coli (E.coli)* was mainly susceptible to Cefotaxime, Cefuroxime, Amikacin, ciprofloxacin and meropenem. Similar pattern was recorded for *Klebsiella* and *Enterobacter*. *Staphylococcus* species was susceptible to cefotaxime, ciprofloxacin and Nalidixic acid. Pseudomonas species was susceptible to Cefuroxime.

Table 1: Incidence of UTI among type 2 diabetic patients

Variable	Number	Percentage
UTI present	30	30
UTI absent	70	70
Total	100	100

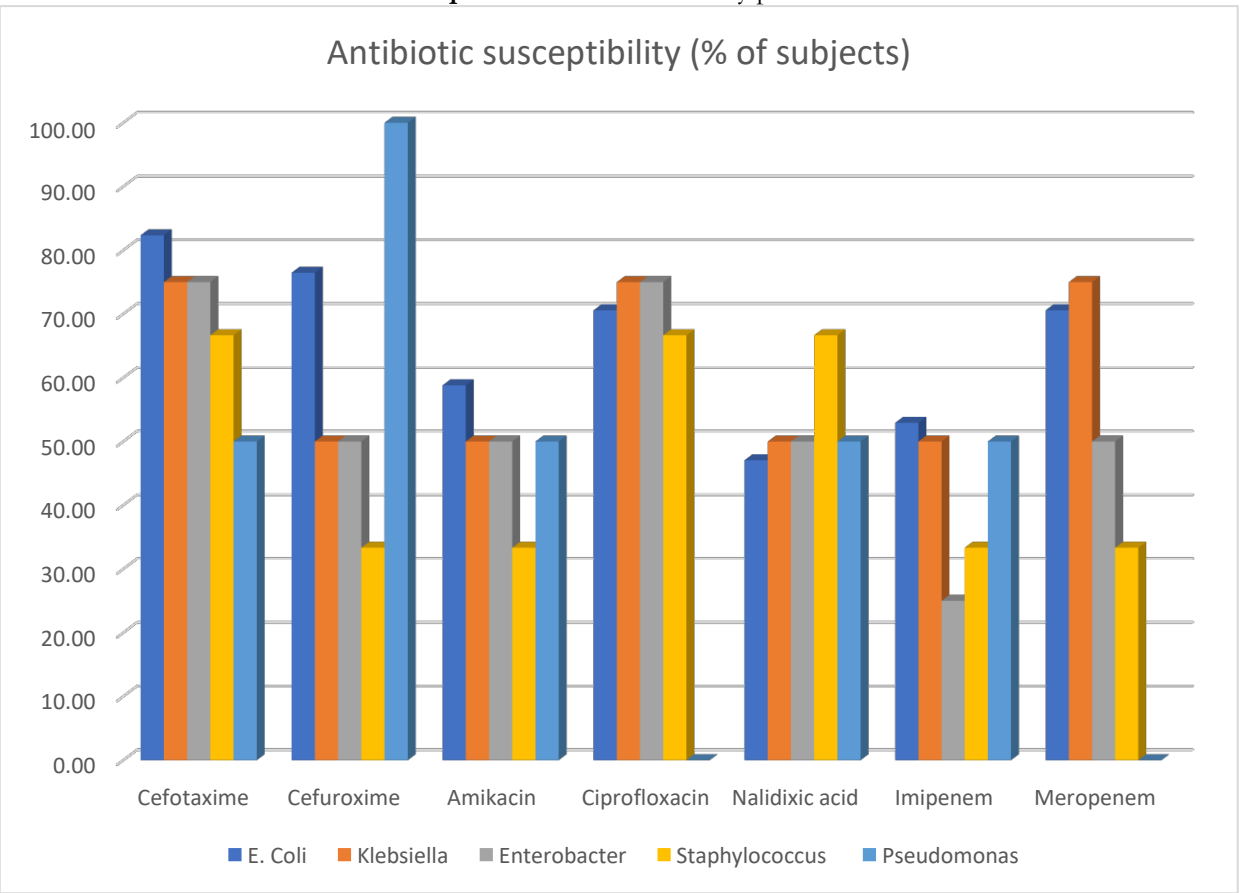
Table 2: Microbiological profile

Microbiological profile	Number	Percentage
Escherichia coli	17	56.67
Klebsiella species	4	13.33
Enterobacter species	4	13.33
Staphylococcus species	3	10
Pseudomonas aeruginosa	2	6.67

Table 3: Antibiotic sensitivity pattern

Variables	*E. Coli* (n=17)	*Klebsiella* (n=4)	*Enterobacter* (n=4)	*Staphylococcus* (n=3)	*Pseudomonas* (n=2)
Cefotaxime	14	3	3	2	1
Cefuroxime	13	2	2	1	2
Amikacin	10	2	2	1	1
Ciprofloxacin	12	3	3	2	0
Nalidixic acid	8	2	2	2	1
Imipenem	9	2	1	1	1
Meropenem	12	3	2	1	0

Graph 1: Antibiotic sensitivity pattern



Discussion

Diabetes Mellitus is an ever-growing metabolic and endocrine disorder characterized by hyperglycemia resulting from defects in insulin secretion, action, or both and is so rampant in the western and industrialized nations as the majority of patients are visiting primary care and family medicine clinics for the treatment of diabetes mellitus. The recent forecast from the Global Burden of Diseases survey of 2017 estimates 462 million individuals to have been affected by type 2 DM, corresponding to 6.2% of the planet's population (4.4% aged 15–49 years, 15% aged 50–69, and 22% aged 70+ years) and a point prevalence rate of 6059 patients over 10,000 population.[8- 11]

The increased prevalence of UTIs in diabetic people may result from variations in the host response between diabetic and non-diabetic patients, disparities in the infecting microbial strains, or a combination of both factors. While the exact mechanisms remain partially elucidated, a number of potential hypotheses have been suggested to clarify the connection between diabetes and UTI, including altered growth conditions (resulting from glucosuria and diabetes associated neuropathy) and altered pathogen–host interactions as a result of diabetes.[11-14]

A total of 100 type 2 diabetic patients were analyzed. Mean age of the patients was 45.3 years. Out of these 100 patients, UTI was seen in 30 percent of the patients. Escherichia coli was the predominant micro-organism found to be present in 56.67 percent of the patients. *Klebsiella* species, *Enterobacter* species, *Staphylococcus* species and *Pseudomonas aeruginosa* was present in 13.33 percent, 13.33 percent, 10 percent and 6.67 percent of the patients respectively. The incidence and clinical and microbiological features of UTI between diabetic and non-diabetic patients was compared in a previous study conducted by Kumar R et al. For every diabetic patient, one non-diabetic control was included. In the diabetes group, 35/256 (13.67%) patients had culture-positive UTI as compared to 18/250 (7.2%) in the non-diabetic group. Diabetic group had twice the risk of UTI and female gender in the diabetic group had a risk of almost five times that of the non-diabetic group. In the diabetic group, 31.4% patients were asymptomatic as compared to 5.6% in the non-diabetic group. E. coli was the most commonly identified microorganism in both groups. *Pseudomonas aeruginosa* was identified in 14% of diabetic cases and none in the non-diabetic. UTIs are more frequent among diabetics.[14]

In the present study, *E.coli* was mainly susceptible to Cefotaxime, Cefuroxime, Amikacin, ciprofloxacin and meropenem. Similar pattern was recorded for *Klebsiella* and *Enterobacter*. *Staphylococcus* species was susceptible to cefotaxime, ciprofloxacin and

Nalidixic acid. *Pseudomonas* species was susceptible to Cefuroxime. Jagadeesan S et al, in a previous study assessed the etio-clinical profile of Urinary tract infection among Diabetes Mellitus patients. Mean age of the participants was 52.18 with age and gender being reasonably distributed in both the groups. Fever, dysuria, urgency and urinary frequency found frequently among non-diabetics wherein vomiting and incontinence relatively commoner among diabetics. *E. coli*, *Klebsiella* sp., were the most common organisms in both groups with *Proteu*s sp., and *Pseudomonas* sp., higher among diabetics. Severe infection and Pyelonephritis were frequent among diabetics. Antimicrobial sensitivity patterns were not significantly different among both groups. Primary care physicians are to be acquinted with the possibility that UTI in diabetics could exhibit relatively lesser symptoms or more severe forms of UTI at presentation and less favorable outcomes.[15] Biswas D et al assessed bacteriuria among diabetics and to look for its associated factors in diabetics. Bacteriuria was found in 43 out of 100 participants. Prevalence was significantly more among females (54%) as compared to males (32%). Factors like poor glycaemic control, complications like neuropathy, diabetic foot were significantly associated with bacteriuria. E Coli was the most common bacterial isolate. Urinary tract infection is common in diabetic patients, especially females, and other clinical factors like uncontrolled sugar levels also play a role.[16] In a previous study conducted by Eshwarappa M et al, authors determined the presentation and risk factors associated with community-acquired urinary tract infection (CA-UTI). The distribution of bacterial strains isolated from these patients and their resistance pattern were also studied. Symptomatology and others risk factors for CA-UTI were studied in these patients and the causative organisms and their resistance patterns were recorded. Of the total 510 patients included, 57% belonged to the elderly age group (50–79 years). Fever and dysuria were the most common clinical presentation, but were not specific in predicting CA-UTI. Escherichia coli (66.9%) was the most common organism causing CA-UTIs with extended spectrum beta lactamase (ESBL) resistance seen in nearly two-thirds of these cases (42.2%). The organisms recorded least resistance against carbapenems (3.9%).[17] Kiranmala K et al, in another study, studied the clinical and microbiologic profiles of UTIs. Similar to previous Indian studies, T2DM patients with UTI had significantly more asymptomatic bacteriuria, asymptomatic bacteriuria (32% vs. 6%), previous history of UTI (25% vs. 2%), and prior catheterization (16% vs. 1%). Escherichia coli (E. coli) was the most common organism isolated and showed sensitivity pattern of meropenem > netilmicin > amikacin > nitrofurantoin. Ceftriaxone was the most common empirical therapy given in spite the prevailing low sensitivity of E. coli to it. All ASB cases were treated unlike recommendations. Ceftriaxone is the most common empirical therapy given in spite the prevailing low sensitivity of E. coli to it.[18]

Conclusion

UTI is found to be affecting significant proportion of type 2 diabetic patients. Hence; adequate knowledge of the microbiological profile and antibiotic sensitivity patterns helps early treatment planning and reducing the morbidity associated with it.

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