CLINICAL AND MICROBIOLOGICAL PROFILE OF URINARY TRACT INFECTIONS IN DIABETIC PATIENTS

Kothai Gnanamoorthy[1], R. Vimal Kumar[2], Suthakaran Prasanna Karthik[3]

[1]Associate Professor, Department of General Medicine, ESIC Medical College and PGIMSR, K. K. Nagar, Chennai.
[2]Consultant Cardiologist, St. Joseph Hospital, Anna Nagar, Chennai.
[3]Associate Professor, Department of General Medicine, Saveetha Medical College and Hospital, Saveetha University, Thandalam, Chennai.

ABSTRACT

BACKGROUND
Diabetes mellitus is a major risk factor for urinary tract infections (UTIs) and is also associated with increased risk of complicated UTI. Improved outcomes of these entities may be achieved by early diagnosis, knowledge of common predisposing factors, appropriate clinical and radiological assessment, and prompt management.

MATERIALS AND METHODS
120 diabetic patients were included in the study after fulfilling the inclusion and exclusion criteria. After obtaining consent and history, clinical examination was done; a midstream urine sample was collected in a sterile container and sent for urine culture and sensitivity. Data obtained was recorded and analysed using SPSS version 22.

RESULTS
Data was collected from 120 diabetics and analysed. Urinary tract infection was present among 27.5% diabetics. UTI was independent of the patient's age and HbA1c levels. Longer the duration of diabetes mellitus, greater is the risk of urinary tract infection. The most common organism isolated was E.coli followed by Klebsiella spp. Most of the organisms showed good sensitivity to amikacin.

CONCLUSION
The prevalence of UTI among the diabetics is considerably high. Because of the frequency and severity of UTI in diabetic patients, prompt diagnosis and early treatment is necessary to prevent consequent complications.

KEYWORDS
Urinary tract infections, complicated UTI, pyuria, E.coli, Klebsiella.

BACKGROUND
Among diabetic patients, the risk of urinary tract infections is usually increased by 60% when compared to other individuals.[1] This has been attributed to the changes that occur in the diabetic host defense mechanisms and presence of diabetic nephropathy and cystopathy.[2] Diabetes is associated with increased severity of infection and prolonged hospital stay.[3] Serious complications of urinary tract infection such as emphysematous cystitis, pyelonephritis, renal or perinephric abscess, bacteraemia and renal papillary necrosis occur more commonly in diabetic patients.[4]

Increased adherence of bacteria to uroepithelial cells in diabetic women is also one of the causes for increased prevalence of urinary tract infection.[5] In a recent study, uropathogenic E.coli which were expressing type-1 fimbriae were more adherent to cells from women with diabetes as compared to cells collected from women without diabetes.[6] In this background, the present study was aimed at determining the prevalence of UTI in a cross sectional survey of diabetic patients, and also to determine the antibiotic susceptibility profile of some of the antibiotics routinely used to treat UTI.

MATERIALS AND METHODS
A prospective observational study was conducted at our hospital for a period of 1 year. 120 diabetic patients were included in the study after excluding patients with structural abnormalities of the urinary tract, recent urinary tract infection, pregnancy or history of use of recent antimicrobial agent usage.

After obtaining consent, a detailed history and relevant clinical examination was done. Fasting, post prandial blood sugars and HbA1C levels were estimated. Each individual was explained on the technique of urine collection. Midstream clean voiding urine specimens were collected in a wide mouthed sterile container. All urine samples were

immediately sent to Microbiology laboratory and cultured. Urine culture was performed according to standard procedure. All urine samples were cultured on Nutrient agar, MacConkey and Blood agar to identify organism.

Antibiotic sensitivity was tested by using Muller-Hinton agar plate by Kirby Baur's disc diffusion method. Ciprofloxacin, Norfloxacin, Amikacin, Gentamicin, Erythromycin, Nitrofurantoin, Piperacillin – Tazobactam, Ceftriaxone, Cefotaxime, Cotrimoxazole, Cloxacillin, Vancomycin, Amoxycillin and Ceftazidime were the common drugs used.

Statistical analysis was done using standard statistical packages. Data were analysed by SPSS statistical software version 22 and P value of <0.05 was considered significant. Mean values were reported as mean ± standard deviation.

RESULTS

Out of the 120 patients, 60 were females. The age of the patients ranged from 19 to 93 years with a mean of 53.22 ± 13.86. Majority of study subjects belonged to age group 51 to 60 years which was followed by 41 to 50 years. Age distribution of study group was represented in Figure 1. Duration of diabetes in this group was between within 1 year to 28 years with a mean of 9.09 ± 6.37. Most of them (65%) had diabetes for less than 10 years of duration (Figure 2).
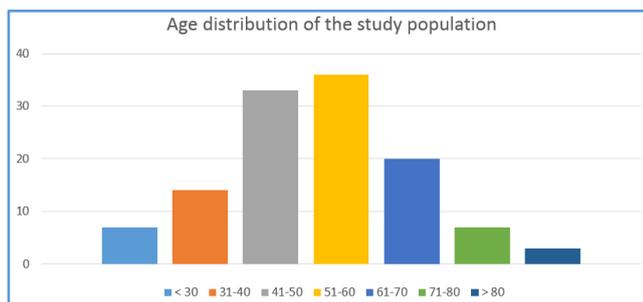

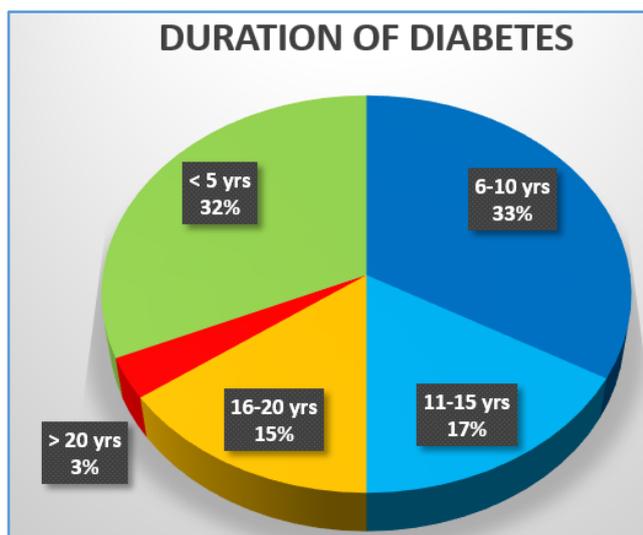*Figure 1. Age Distribution of the Study Patients*

Figure 2. Duration of the Diabetes among Study Patients

Out of the 120 patients, 7 had Type 1 Diabetes and 113 had Type 2 Diabetes Mellitus. Mean values of fasting plasma

glucose, postprandial plasma glucose and HbA1c were 165.39±57.95 mg/dL, 258.10±79.53 mg/dL and 7.74±0.90% respectively. Mean values of systolic and diastolic blood pressure were 132.50±7.29 and, 84.63±5.79 mmHg respectively. Mean values of Height, Weight and BMI were 161.16±12.69 cm, 68.88±13.33 Kg, and 26.29±2.36 kg/m².

Symptoms of UTI were present only in 5% patients (n=6) irrespective of their sex and urine culture results. 25% patients (n=30) had pyuria. In this study, 27.5% patients (n=33) were culture positive for UTI. Out of the 33 patients, 24 were female (72.7%) which was statistically significant (p = 0.002). Out of 33 culture positive subjects, only 6 subjects had symptoms of UTI and this difference was statistically significant (p=0.0001).
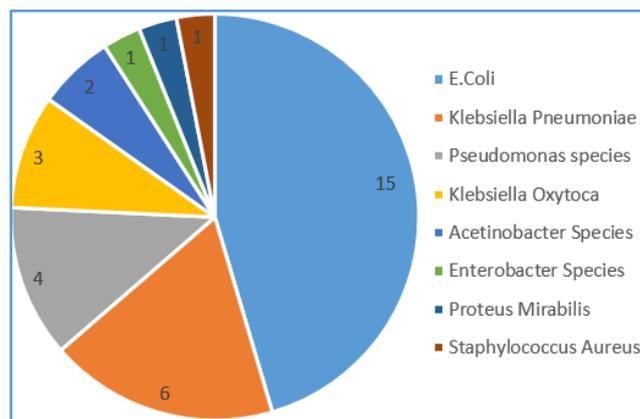

Figure 3. Organisms Grown in Culture

Out of 33 persons with UTI, 23 subjects had diabetes for duration of more than 10 years which was statistically significant (p value = 0.0001). Among the organisms cultured, Escherichia coli was the most common organism followed by Klebsiella pneumoniae and Pseudomonas species. Figure 3 shows the frequency and percentage of bacterial organisms causing UTI in study population. Most of the organisms (51.51%) showed sensitivity to Amikacin in this study followed by Piperacillin Tazobactam (42.42%). ESBL producing organisms were found in 12.12% (n = 4) of the cultures. Most of the E.coli and Klebsiella strains isolated were sensitive to amikacin. One isolate of Enterobacter species was isolated which showed sensitivity to almost all of the commonly prescribed drugs. Three isolates of Klebsiella oxytoca were sensitive only to amikacin. Four isolates of Pseudomonas species were sensitive only to few (<4) drugs.

DISCUSSION

In this study, out of 120 subjects with diabetes, 33 subjects (27.5%) had urinary tract infection. The prevalence among females and males was 20% and 7.5% respectively. These results were comparable with previous studies. Alebiosu et al conducted a study in Nigeria among 124 type 2 diabetics (55 males and 69 females) and found that 26.6% of patients (n = 33) had significant bacteriuria.[7] Jaspan et al conducted a study among 198 subjects (111 females and 87 males) and

found the prevalence of bacteriuria to be 27% among females and 8% among males.[8] O'Sullivan et al also conducted a study among 91 female and 59 male diabetics and showed that the prevalence was 19.8% and 3.3% respectively.[9]

According to this study, age had no significant relation (p value 0.927) with urinary tract infection in diabetic population. This was similar to the findings of Boykyo et al and Boroumand et al.[10,11] There was a statistically significant relation between female sex and UTI in diabetics. Various studies done earlier have also showed that the prevalence of UTI was more among female diabetics.[8,9,12] In the present study, there was a statistically significant relationship between female sex and asymptomatic UTI (p = 0.016) which is comparable to the findings of Bonadio et al who found that bacteriuria was common among women and they remained mostly asymptomatic.[13]

There was a statistically significant relation between duration of diabetes and UTI. (p <0.001) which was similar to the findings of Geerlings et al and Janifer et al.[14,15] There was no significant relation between HbA1c levels at the time of urine culture and Urinary Tract Infection (p = 0.778) which was comparable with previous published studies.[11,14]

Like other studies, Escherichia coli was the most common organism (45.5%) isolated from urine culture which is similar to many previous studies.[10,15,16] Klebsiella pneumoniae was the second most common organism (18.2%) followed by Pseudomonas species (12.1%) and Klebsiella oxytoca (9.1%).

CONCLUSION

The study found that female sex and longer duration of diabetes are associated with risk of developing UTI among diabetic patients. Asymptomatic UTI remains very common among females with diabetes. The antimicrobial sensitivity to drugs which were commonly used previously was found to be declining. Frequent irrational usage, inadequate dosage, and non-compliance of patients may be the reason for the emergence of resistance. But further studies by comparing the antibiograms of nondiabetic patients with diabetic patients can shed more light on this matter.

REFERENCES

[1] Hirji I, Guo Z, Andersson SW, et al. Incidence of urinary tract infection among patient with type 2 diabetes in the UK General Practice Research Database (GPRD). J Diabetes Complications 2012;26(6):513-516.

[2] Sridhar CB, Anjana S, Mathew JT. Acute infections. In: Ahuja MMS, Tripathy BB, Sam Moses GP, et al, eds. RSSDI text book of diabetes mellitus. 1st edn. Hyderabad, India: Jaypee Brothers Medical Publishers 2002:471-478.

[3] Aro S, Kangas T, Reunanen A, et al. Hospital use among diabetic patients and the general population. Diabetes Care 1994;17(11):1320-1329.

[4] Nicolle LE. Asymptomatic bacteriuria in diabetic women. Diabetes Care 2000;23(6):722-723.

[5] Svanborg-Eden C, Jodal U. Attachment of Escherichia coli to urinary sediment epithelial cells from urinary tract infection-prone and healthy children. Infect Immun 1979;26(3):837-840.

[6] Geerlings SE, Meiland R, van Lith EC, et al. Adherence of type 1-fimbriated Escherichia coli to uroepithelial cells: more in diabetic women than in control subjects. Diabetes Care 2002;25(8):1405-1409.

[7] Alebiosu CO, Osinupebi OA, Olajubu FA. Significant asymptomatic bacteriuria among Nigerian type 2 diabetics. J Natl Med Assoc 2003;95(5):344-359.

[8] Jaspan JB, Mangera C, Krut LH. Bacteriuria in black diabetics. S Afr Med 1977;51(12):374-376.

[9] O'Sullivan DJ, FitzGerald MG, Meynell MJ, et al. Urinary tract infection. A comparative study in the diabetic and general populations. Br Med J 1961;1:786-788.

[10] Boyko EJ, Fihn SD, Scholes D, et al. Diabetes and the risk of acute urinary tract infection among postmenopausal women. Diabetes Care 2002;25(10):1778-1783.

[11] Boroumand MA, Sam L, Abbasi SH, et al. Asymptomatic bacteriuria in type 2 Iranian diabetic women: a cross sectional study. BMC Women's Health 2006;6:4.

[12] Vejlsgaard R. Studies on urinary infections in diabetics. I. Bacteriuria in patients with diabetes mellitus and in control subjects. Acta Med Scand 1966;179(2):172-182.

[13] Bonadio M, Costarelli S, Morelli G, et al. The influence of diabetes mellitus on the spectrum of uropathogens and the antimicrobial resistance in elderly adult patients with urinary tract infection. BMC Infect Dis 2006;6:54.

[14] Geerlings SE, Stolk RP, Camps MJL, et al. Asymptomatic bacteriuria may be considered a complication in women with diabetes. Diabetes Mellitus Women Asymptomatic Bacteriuria Utrecht Study Group. Diabetes Care 2000;23(6):744-749.

[15] Janifer J, Geethalakshmi S, Satyavani K, et al. Prevalence of lower urinary tract infection in South Indian type 2 diabetic subjects. Indian J Nephrol 2009;19(3):107-111.

[16] Papazafiropoulou A, Daniil I, Sotiropoulos A, et al. Prevalence of asymptomatic bacteriuria in type 2 diabetic subjects with and without microalbuminuria. BMC Research Notes 2010;3:169.