

# URINARY TRACT INFECTION

## FREQUENCY AND PATTERN IN PATIENTS WITH DIABETES MELLITUS

ORIGINAL  
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**ABSTRACT... Objective:** To determine the frequency and pattern of urinary tract infection in patients with diabetes mellitus. **Design:** Descriptive case series study. **Period:** February 2009 to July 2009. **Setting:** Department of medicine at Liaquat University Hospital). **Patients and methods:** All patients  $\geq 18$  years of age, of either gender were known diabetes for  $\geq 2$  years duration. The infection was labeled when  $>5$ /hpf leukocyte in urine and growth of organism on urine for C/S. The blood sugar and hemoglobin A1C (HbA1C) was also advised to evaluate the status of their diabetes i.e. control or poorly control. **Result:** During study period total 150 diabetic patients were evaluated for urinary tract infection, of which 92(61%) had UTI. Out of ninety two 80(87%) had diabetes type 2 and 12(13%) were diabetes type 1. The female gender was predominant. The mean  $\pm$  SD for age of patients with type 2 and type 1 diabetes mellitus was  $53.52 \pm 10.74$  and  $20.77 \pm 1.65$  whereas the mean random blood sugar level in patients with type 2 and 1 diabetes was  $232.85 \pm 5.87$  and  $288.99 \pm 7.87$ . The mean  $\pm$  SD for duration of diabetes type 2 and 1 was  $4.77 \pm 2.31$  and  $2.56 \pm 1.42$ . The isolated microorganism were Staphylococcus aureus, Escherichia coli, Proteus, Pseudomonas aeruginosa, Klebsiella, Enterobacteriaceae and C.albicans. **Conclusions:** The urinary tract infection is more prevalent in patients with diabetes mellitus.

**Key words:** Urinary tract infection (UTI), diabetes mellitus

## INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic diseases characterized by increase blood glucose level resulting from defects in insulin secretion, insulin action, or both<sup>1</sup>. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. The cross sectional survey conducted earlier in rural and urban areas of Pakistan upon 5433 individual which show 19% prevalence of diabetes mellitus<sup>2</sup>.

Diabetes mellitus (DM) has a number of effects on genitourinary system. Patients with Type1 DM and Type 2 DM are at increased risk for urinary tract infection<sup>3</sup> and estimated to affect 16 million persons in the United States, predisposes to UTI is widespread<sup>4</sup>. Diabetes causes several abnormalities of the host defense system

that might result in a higher risk of certain infections, including UTI. These include immunologic impairments, such as impaired migration, intracellular killing, phagocytosis, and chemotaxis of polymorphonuclear leukocytes from diabetic patients<sup>5</sup> and neuropathic complications, such as impaired bladder emptying. In addition, a higher glucose concentration in the urine may create a culture medium for pathogenic microorganisms.

Under some circumstances urine may be inhibitory or even bactericidal against uro-pathogens. Modification of chemical composition of urine in diabetes mellitus can alter the ability of urine and support the growth of microorganisms. In experimental animals osmotic diuresis secondary to glycosuria predispose to ascending E coli infection. Autonomic neuropathy in diabetes mellitus impairs bladder emptying and subsequent urological manipulation predispose to UTI<sup>7</sup>. The prevalence reported by Tahir et al for urinary tract

infection in patients with diabetes mellitus was 44%<sup>6</sup>.

Therefore considering the increasing incidence of urinary tract infection with time the present study was conducted in a tertiary care 1500 bedded teaching hospital of Hyderabad that covers the patients of both i.e. rural as well as urban areas and provides all emergency management facilities. This study concerned with evaluation of urinary tract infection in patients with diabetes mellitus.

### PATIENTS AND METHODS

This descriptive case series study was carried out in the department of medicine at Liaquat University Hospital (a tertiary care 1500 bedded hospital) Hyderabad from February 2009 to July 2009. All patients  $\geq 18$  years of age, of either gender were known diabetes for  $\geq 2$  years duration presented with shaking chills, fever, pain or burning when urinating, altered urine colour, urethral discharge, frequent and urgent need to urinate, blood in the urine, discomfort in the middle of the lower abdomen (supra pubic pain and flank pain) with nausea and vomiting, through outdoor patient department (OPD), indoor patient and causality outdoor department (COD) were evaluated and enrolled in the study. The referral diabetic patients from different wards of hospital with similar presentation were also taken and evaluated for urinary tract infection. The detail history of all such patients was taken; complete clinical examination and routine investigations were performed. The blood sugar and hemoglobin A1C (HbA1C) was also advised to evaluate the status of their diabetes i.e. control or poorly control. For the evaluation of UTI all such subjects were advised for Urine microscopy the method for quantitating the number of leucocytes in the urine was glass slide microscopy. The infection labeled when  $>5$ /hpf leukocytes in urine, growth of organism on urine culture and sensitivity (C/S) by collecting urine sample in sterilize bottle, labeled it and sent to laboratory for analysis. The non cooperative patients or who refused to participate in the study were considered to be in exclusion criteria. The informed consent was taken from every patient or from attendant of patients after full explanation of procedure regarding the study, and all such maneuvers were under medical ethics. The data was collected through a pre-

formed performa / questionnaire. The data was collected, saved and analyzed in SPSS version 10.00. The frequency and percentage of UTI and associated pathogens was calculated. The frequency and percentage was also calculated for gender distribution. The mean and standard deviation was calculated for age. The chi square test was applied on categorical variables and the p-values  $\leq 0.05$  was considered as statistically significant.

### RESULTS

During study period total 150 diabetic patients were evaluated for urinary tract infection, of one hundred fifty, 142 from medical ward and 08 were referral diabetic patients from department of Gynecology & Obstetrics. Out of 150, 92(87%) had detected urinary tract infection. Of ninety two 80 had diabetes type 2 and 12(13%) were diabetes type 1. The gender distribution in relation to urinary tract infection is shown in Table-I. The mean  $\pm$  SD for age of patients with type 2 and type 1 diabetes mellitus was  $53.52 \pm 10.74$  and  $20.77 \pm 1.65$ . The glycaemic status is shown in Table-II whereas the mean random blood sugar level in patients with type 2 and 1 diabetes was  $232.85 \pm 5.87$  and  $288.99 \pm 7.87$ . The mean  $\pm$  SD for duration of diabetes type 2 and 1 was  $4.77 \pm 2.31$  and  $2.56 \pm 1.42$ . The isolated microorganisms as far as diabetes is concerned are shown in Table III. Regarding the demographical distribution majority of the patients were from rural communities.

**Table-I. Gender distribution of patients with urinary tract infection**

| Gender | UTI        |            | Total      | P-value |
|--------|------------|------------|------------|---------|
|        | Positive   | Negative   |            |         |
| Male   | 29 (48.3%) | 23 (71.9%) | 52 (56.5%) | 0.03*   |
| Female | 31 (51.7%) | 9 (28.1%)  | 40 (43.5%) |         |
| Total  | 60 (100%)  | 32 (100%)  | 92 (100%)  |         |

*\*Statistically significant*

### DISCUSSION

Urinary tract infections (UTIs) are a common burden in patients with diabetes mellitus due to compromised immune systems. Cystitis, ascending infections leading

**Table-II. Glycaemic status of patients with urinary tract infection**

| Glycaemic status | UTI           |               | Total         | P-value    |
|------------------|---------------|---------------|---------------|------------|
|                  | Positive      | Negative      |               |            |
| Poorly control   | 52<br>(86.7%) | 04<br>(12.5%) | 56<br>(60.9%) |            |
| Good control     | 08<br>(13.3%) | 28<br>(87.5%) | 36<br>(39.1%) | <0.01<br>* |
| Total            | 60<br>(100%)  | 32<br>(100%)  | 92<br>(100%)  |            |

\*Statistically significant

to pyelonephritis, emphysematous complications and renal and perinephric abscesses are well recognized in this group of patients especially if glycaemic control is poor. The prevalence of UTI varies widely by age and gender; this confirms the importance of demographic and clinical characteristics when considering further diagnostic testing. The risk of UTI was higher with increasing duration of diabetes. The quantitative prevalence estimates presented in our study provide the clinician with a better sense of the relative importance of each variable. In present study the reported prevalence of urinary tract infection in diabetes was 61% of which 87% in diabetes type 2 and 13% in diabetes type 1 and it can be compared with the study of Lerman-Garber et al<sup>7</sup> which shows that the overall prevalence of infection was 46.5% (slightly lower than our study) and proved the association of urinary tract infection and diabetes. The finding of present study can be comparable with the study of Patel, et al,<sup>8</sup> which was a 14 years prospective study, about the complications of urinary tract infection, done on 8793 hospitalized cases. He has reported acute and chronic urinary tract infection in 31.4% of patients with diabetes mellitus. In our study the female population was predominant to acquire urinary tract infection and it is consistent with the study by Brauner et al<sup>9</sup>. In our study 61% patients had poor glycaemic control and Brauner et al hypothesized that good glycaemic control helps in reducing the prevalence of urinary tract infection<sup>9</sup>.

Bacteriological studies usually reveal the involvement of gram negative enteric organisms that commonly causes

**Table-III. Pathogens identified on urine culture and sensitivity**

| Pathogens              | n=92 (%) |
|------------------------|----------|
| Escherichia coli       | 58 (65%) |
| Proteus                | 12 (13%) |
| Staphylococcus aureus  | 11 (12%) |
| Pseudomonas aeruginosa | 04 (05%) |
| Klebsiella             | 03 (03%) |
| Enterobacteriaceae     | 02 (02%) |
| C.albicans             | 02 (02%) |

urinary tract infections such as E. coli, Klebsiella species, and the Proteus species<sup>10</sup>. Similarly, the predominant numbers of pathogens isolated in our study were gram negative bacilli. Among the patients infected with gram negative bacilli in our study, Escherichia coli was isolated from 58(63%) of the subjects, Klebsiella spp. from 03(03%), Pseudomonas spp. from 04(05%), Staph. aureus 11(12%) and the Proteus spp in 12(13%) and can be contrast with the study by Brauner et al<sup>9</sup> reported prevalence of E.coli 55% of urine culture in diabetic patients. Hoepelman suggested mechanisms of an increased susceptibility to UTI are (a) decreased antibacterial activity due to the 'sweet urine', (b) defects in neutrophil function (c) increased adherence to uroepithelial cells and UTI in diabetics should be treated as complicated UTI with agents reaching high tissue levels for 10–14 days<sup>11</sup>. The diabetes severity and duration are the main determinants of higher UTI and asymptomatic bacteriuria risk-a pattern that resembles the relation between diabetes characteristics and other complications, such as retinopathy or neuropathy. Therefore, one would expect that improved diabetes control might yield a reduction in incidence of urinary tract infection.

## CONCLUSIONS

The urinary tract infection is more prevalent in patients with persistent raised blood glucose level or poorly glycaemic control while E.coli is the main uropathogen for UTI in patients with diabetes mellitus.

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**Knowledge speaks,  
but wisdom listens.**

(Jimi Hendrix)