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A comparative study to assess clinical and characteristic differences of urinary tract infections between diabetic and non-diabetic patients

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Abstract
Aims: To investigate the clinical and characteristic differences of urinary tract infections between diabetic patients and non-diabetic patients.
Methods: The current research is being carried out at a tertiary care center, for the period of 6 months. There are a total of 50 diabetics and 50 people who do not have diabetes in this study. An exhaustive inquiry and historical assessment were carried out. SPSS, a statistical tool, was used to do the final analysis on the data. The chi square test was used to compare the percentages of participants in the various groups, and the student t test was used to compare the means.
Results: The mean age among diabetic and non-diabetic patients was 56.89±12.56 years and 51.36±11.53 years. The majority of patients will first come with a fever. In both diabetes and non-diabetes, BPH was the most prevalent predisposing factor, and indwelling catheterization was the second most common; however, there was no statistically significant difference between the two. The majority of diabetic patients diagnosed with UTI (87.14 percent) had HbA1C levels that were more than 6.5 percent, and this difference was statistically significant. In diabetics, the incidence of recurrent UTI is greater than in non-diabetic populations; nevertheless, there was no statistically significant difference between the two groups. In both diabetics and those without diabetes, the risk of recurrent UTI is greater in females.
Conclusion: The presence of diabetes, inadequate glycaemic management, fever, and female genital sex were the host variables that were shown to be related with urinary tract infections (UTIs).

Keywords: HbA1c, UTI, diabetic patients

Introduction

The urinary system is the most common and serious site of infection in people with diabetes. Acute pyelonephritis was shown to be five times more common in those with diabetes at autopsy compared to those without the disease. Most diabetics with urinary tract infections have no symptoms at all [1]. Individuals with poor diabetes control, abrupt ketoacidosis, or diabetic sequelae such nephropathy, vasculopathy, and neuropathy are at a much higher risk for developing life-threatening infections. This silent infection can cause significant harm to the kidneys, sometimes leading to renal failure.

Bacteriuria affects diabetics more than non-diabetics due to a combination of host and local risk factors. A variety of unusual urinary tract infection consequences, such as emphysematous pyelonephritis and emphysematous cystitis, are more prevalent among diabetics [2].

In diabetic individuals, several abnormalities (low complement factor 4, lower cytokine response following stimulation) in humoral innate immunity have been observed [3]. However, the clinical significance of these observations is unknown. In terms of cellular innate immunity, most studies reveal that diabetes polymorphonuclear cells and diabetic monocytes/macrophages have lower functions (chemotaxis, phagocytosis, killing) than control cells. In general, improved diabetes mellitus control leads to an improvement in these cellular processes.

As a result, investigating bacteriuria in diabetic patients by screening for urinary tract infection is critical in order to correctly treat it and avoid the development of diabetic renal problems and, finally, serious renal damage and failure [4].

But there are disagreements about the incidence, prevalence, and microbiological differences

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between diabetics and people who don't have diabetes. 514 diabetic outpatients and 405 non-diabetic controls were used to study the prevalence of bacteriuria, as well as the virulence and host factors of the bacteria. Researchers found that the number of diabetic women with bacteriuria (15/239, or 6.3%) was not significantly higher than the number of non-diabetic women with bacteriuria (8/236, or 3.4%) [5]. Men with and without diabetes had the same rate, but it was lower than in women. Hence the study was planned to compare clinical and characteristic differences of urinary tract infections between diabetic patients and non-diabetic patients.

Methods
This Prospective study was carried out at tertiary care center for the period of 6 months. Detailed history including age, sex, occupation and symptomatology were taken. Detailed general and systemic clinical examination was done. 50 diabetics (29 females and 21 males) and 50 non-diabetics (26 females and 24 males) admitted in hospital were studied randomly.
All proven diabetics (fasting venous glucose > 126 mg/dl and postprandial (2 hr.) venous glucose >200 mg/dl were included in the study irrespective of reason for admission. All patients with history of diabetes and those who are on treatment were also eligible for admission.

Inclusion criteria
Culture positive urinary tract infections

Exclusion criteria
1. Culture negative urinary tract infections, Age <18 years, Patients.
2. Controls were taken from patients admitted in hospital with comparable age and sex who were proven not be diabetic (absence of history of diabetes and anti-diabetic drugs and fasting blood sugar <110 mg/dl).

Investigations
Investigation done in all patients included hemoglobin, total WBC count, differential count, ESR, urine for protein, sugar, ketones and microscopy.
A fasting, post prandial sugar and glycosylated hemoglobin was done for all diabetics. Diabetes was diagnosed by history of diabetes, intake of anti-diabetic drugs and newly detected diabetics
Urine culture and gram stain done using Blood agar plate, MacConkey agar plate (MAC) (or another selective/ differential media), anaerobic blood agar plate (for suprapubic, cystoscopy and nephrostomy specimens)
Patients with positive urine cultures underwent appropriate investigations in the form of ultrasound abdomen, X ray, and CT abdomen to look for the predisposing conditions and to aid in the clinical management

Data analysis
Data was analysed using statistical package SPSS. The percentages in different categories were compared using chi square test and means were compared using student 't' test. A p value less than 0.05 was considered significant.

Results

Table 1: Age distribution among diabetics and non-diabetics

Age distribution	Diabetics	Non-Diabetics
Mean ±SD	56.89±12.56	51.36±11.53

The mean age among diabetic and non-diabetic patients was 56.89±12.56 years and 51.36±11.53 years.

Table 2: Symptoms among diabetics and non-diabetics

Symptoms	Diabetes%	Non diabetes%
Fever	89	71
vomiting	44	23
dysuria	75	50
Abdominal pain	40	25
Hematuria	8	4
incontinence	26	15

Fever is the most common presenting symptom. Fever is seen among 89% cases of diabetics and 71% cases of non-diabetics, dysuria in 75% of diabetics and 50% of non-diabetics. Vomiting in 44% of diabetics and 23% of non-diabetics, abdominal pain among 40% of diabetics and 25% of non-diabetics, incontinence among 26% of diabetics and 15% of non-diabetics.

Table 3: Complications of UTI

Complication	Diabetes	Non-Diabetes	p Value
AKI	30	15	
Recurrent UTI	15	6	>0.05 (NS)
Septicaemia	16	29	
Renal papillary necrosis	2	0	

AKI as complication is seen among 30% of diabetics with 15% among non-diabetics, recurrent UTI is seen among 15% of diabetics and 6% of non-diabetics, septicaemia is seen among 16% of diabetics and 29% of non-diabetics and renal papillary necrosis is seen among 2% of diabetics and 0% of non-diabetics.

Discussion
The present study included 50 diabetic and 50 non-diabetic patients with culture positive urinary tract infections.
In this study, authors have tried to determine whether there are differences in the clinical and microbiological patterns in UTI and the antibiotic sensitivity patterns of the pathogens concerned with diabetic and non-diabetic patients.
There was no significant correlation between age of patient and the incidence of UTI in both diabetic and non-diabetic patients. A similar observation in this study (73.7 years in diabetics vs 72.7 years in non-diabetic subjects) [6].
UTIs are more common in type 2 DM than in type 1 DM. The small number of people with type 1 diabetes in this study makes it impossible to draw such a conclusion [7].
We found a strong link between how long someone has had diabetes and how often they have bacteriuria. Every 10 years that a person had diabetes; the number of people who had bacteriuria went up by 1.9 times [8-10]. This is probably because people with long-term diabetes are more likely to have autonomic neuropathy, which makes it hard for the bladder to empty completely.
The majority of diabetic patients diagnosed with UTI (87.14 percent) had HbA1C levels that were more than 6.5 percent, and this difference was statistically significant compared with Bonadio M, et al. (2006) (the mean HbA1c level being 7.8% ± 1.6 SD) [11]. Majority of the diabetics with UTI (87.14%) had HbA1c > 6.5% with p < 0.001. A high proportion of patients (88.8%) with HbA1c < 6.5 and UTI had other underlying factors such as bladder outlet

obstruction or indwelling catheter which predisposed them to UTI. Thus, the occurrence of UTI in diabetics seems to be related to the glycaemic control in the recent (weeks to months). Schmitt JK *et al.* (1986) analysed the correlation between asymptomatic bacteriuria and HbA1c and found no statistically significant association between the degree of glycemic control and UTI. A higher incidence of elevated blood glucose levels was observed in patients with UTI; but did not attribute the elevated blood glucose to be a predisposing factor for UTI [12].

Tseng CC *et al.* (2002) noted that a HbA1c > 8.1% was associated with an increased risk for UTI.11 Our study supports the findings of Tseng CC, *et al.* (2002), who concluded that patients with HbA1c > 8.1% have a higher prevalence of upper UTI. The presence of HbA1c < 6.5% significantly (p= 0.026) decreased the risk of UTI irrespective of whether there was underlying predisposing factor or not. In those patients of UTI with HbA1c < 6.5%, almost 90% of the patients had underlying predisposing factors such as bladder outlet obstruction or indwelling catheter. Thus, achieving an HbA1c < 6.5% particularly seems to protect those diabetics from UTI who do not have an underlying predisposing factor [13]. In this study, the most common organism that causes UTI is *E. coli*, both in diabetic and non-diabetic participants. This organism adheres to urothelial cells by anchoring to glycolipid present on their cell membrane through P fimbriae [14]. P fimbriae is composed of many subunits, the most essential of these is Fim H as it helps in invading the urothelial cells and adhesion to glycoprotein containing mannose compounds [15].

The risk of developing UTI in diabetic and in non-diabetic groups is different because of many reasons, a few of which have been listed above, which is why it is necessary to recognize these risk factors. Identifying these risk factors will help us prevent complications related to UTI in patients with diabetes.

Conclusion
The host factors found to be associated with UTI are presence of diabetes, poor glycemic control, presence of fever. An elevated HBA1C correlates with occurrence of UTI.

Conflict of Interest
Not available

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