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## Clinical Evaluation of Urinary Tract Infections in Patients with Diabetes Mellitus

**B.Jayanth kumar<sup>1\*</sup>, Ch. Manju Sri<sup>1</sup>**

*1.Pharm D intern-student of Bharat Institute of Technology is tie-up with Krishna Institute of Medical Science (KIMS Hospital), Minister Road, Begumpet.*

### ABSTRACT

A study of 90 cases of urinary tract infection in patients with diabetes mellitus has been presented with special reference to epidemiological aspects. A Prospective study was conducted in diabetes mellitus patients with symptomatic Urinary tract infection. This study revealed the incidence of urinary tract infection to be more common in females underlining the fact that females are more prone to infection (Male: Female — 1:2.3).The incidence of urinary infection was progressively higher with the duration of diabetes mellitus, with most infections occurring beyond 10 years of diabetes. Patients most commonly presented with fever, increased frequency of micturation and dysuria and were found to have pyrexia, dehydration and suprapubic tenderness as the commonest clinical signs.

**Keywords:** DM-Diabetes mellitus, UTI-Urinary tract infection.

\*Corresponding Author Email: [jayanthkumar999@gmail.com](mailto:jayanthkumar999@gmail.com)

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## INTRODUCTION

The best early evidence of a description of diabetes is recorded in the Eber's papyrus dating to 1500 B.C.<sup>1</sup> Arateus of Greece in about A.D 150, gave a clinical description of the disease, noting the increased urine flow, thirst and weight loss and coined the term DIABETES, meaning, "siphon" or "to pass through"<sup>2</sup>. Chevreuil in 1815 identified the sugar as identical with "grape sugar"<sup>3</sup>. Claude Bernard postulated that hyperglycemia was due to over production of glycogen by the liver<sup>4</sup>. Langerhans in 1869 described the islet cell formations in the pancreas<sup>5</sup>.

Banting, Best, Macleod and Collip discovered insulin in 1921<sup>6,7</sup>

### **DIABETES MELLITUS:**

The clinical syndrome described by the term Diabetes mellitus results from intolerance to glucose. It is a chronic disease caused by an absolute or relative deficiency of insulin and, although all body systems are ultimately affected, it is primarily a disorder of carbohydrate metabolism.

The term diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs.<sup>8</sup>

Diabetes mellitus causes several abnormalities of the host defense system that might result in a higher risk of certain infections, including urinary tract infection<sup>9</sup>. These include immunologic impairments, such as impaired migration, intracellular killing, phagocytosis, and chemotaxis of polymorph nuclear leukocytes from diabetic patients<sup>10</sup>, and neuropathic complications, such as impaired bladder emptying<sup>11</sup>

### **URINARY TRACT INFECTION:**

A urinary tract infection (UTI) (also known as acute cystitis or bladder infection) is an infection that affects part of the urinary tract. When it affects the lower urinary tract it is known as a simple cystitis (a bladder infection) and when it affects the upper urinary tract it is known as pyelonephritis (a kidney infection). Symptoms from a lower urinary tract include painful urination and either frequent urination or urge to urinate (or both), while those of pyelonephritis include fever and flank pain in addition to the symptoms of a lower UTI.

In the elderly and the very young, symptoms may be vague or non-specific. The main causal agent of both types is *Escherichia coli*, though other bacteria, viruses or fungi be may rarely<sup>12</sup>

Urinary tract infection (UTI) is one of the commonest diseases, occurring from the neonate up

to geriatric age groups. Forty to 50% of adult women have a history of at least one UTI.<sup>13</sup> UTI is a major cause of Gram-negative sepsis in hospitalized patients and after renal transplantation<sup>14</sup>

#### **Aims and objectives:**

- To study the age and sex incidence of urinary tract infections in patients with known diabetes mellitus.
- To study the presenting symptoms and the clinical signs in such patients of diabetes mellitus with urinary tract infection.
- To study the bacteria causing urinary tract infections in patients with known diabetes mellitus.
- To study the complications of urinary tract infections in patients with known diabetes mellitus.

#### **MATERIALS AND METHODS:**

The present study includes the study of diabetic patients admitted in the General Medicine ward of Kim's Hospital, which is a 700 bedded multi-specialty teaching hospital. With symptoms of urinary tract infection from November 2011 to April 2012. This formed the clinical material for the prospective study on the clinical aspects of urinary tract infection in diabetes mellitus. The patients, who were suspected of urinary tract infection clinically, were subjected further for detailed investigations. Their diabetic state was assessed by estimating fasting blood sugar level, post prandial blood glucose level, or glucose tolerance test whichever was required in a particular case. Their diabetic status was managed using either insulin or oral hypoglycemic agents. The observations were recorded and tabulated.

#### **Inclusion Criteria:**

- Patients with diagnosed cases of diabetes mellitus on treatment with either insulin or oral hypoglycemic agent with symptoms of an acute episode of UTI.
- Patients male or female aged 12 years or more.
- patients with a symptomatic urinary infection.

#### **Exclusion criteria:**

- Patients from other hospitals not considered.
- Patients who are asymptomatic UTI's were not included.
- Patients with proven fungal infections were not included.

## **RESULTS AND DISCUSSION**

### **Demographic Data Analysis**

During the study period from November 2011 to April 2012, 102 patients with diabetes mellitus with a urinary tract infection were admitted in the medical wards of KIMS Hospital, out of which 90 patients were chosen based on the inclusion and exclusion criteria mentioned. Following is the analysis of data of these 90 cases,

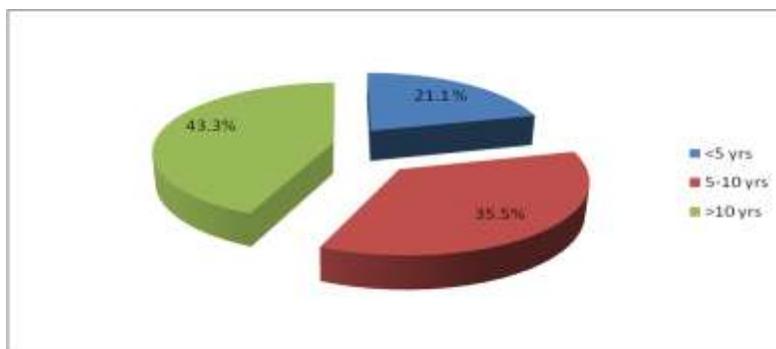
#### Age and Sex Incidence:-

**Table.1 showing age and sex incidence.**

Age in Yrs.	Male	Female	Total	Percentage of Patients
12-20	-	14	14	15.5%
21-30	1	9	10	11.1%
31-40	3	10	13	14.4%
41-50	8	14	22	24.4%
>50	7	24	31	34.4%

In this study, urinary tract infection is found more common in females (78%) than in males (21%). The incidence of urinary tract infection is more in the age group above 50 years.

#### Duration of Diabetes:-



**Figure 1 Showing the duration of Diabetes Mellitus.**

This figure shows that incidence of urinary tract infection increases with the duration of diabetes. The highest incidence found in patients who had diabetes for more than 10 years (43.3%) and least incidence with diabetics with less than 5 years (21.1%).

#### Symptom analysis:

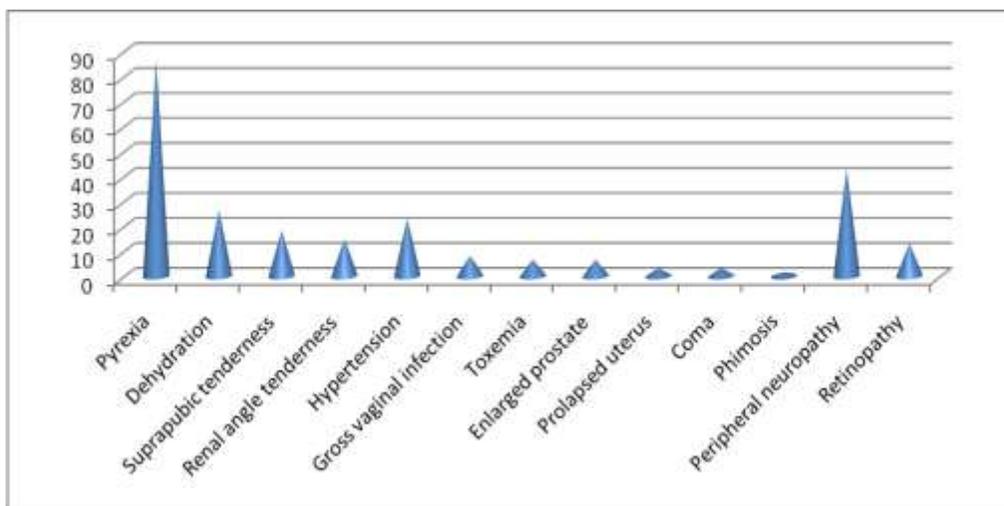
**Table.2 Showing the Symptoms Analysis In Diabetic Patients With Urinary Tract Infection**

Symptom	Number of Patients	Percentage of patients
Fever	52	86.7%
Increased frequency of micturition	48	80%
Dysuria	43	71.7%
Pain abdomen	14	23.3%
Suprapubic pain	9	15%
Vomiting	14	21.3%

Fatigue	9	15%
Renal colic	7	11.7%
Edema of leg	8	13.3%
Haematuria	6	10%
Urethral discharge	4	6.7%
Numbness & tingling of extremities	16	26.7%

- Fever was the commonest symptom in all cases of this study and all were associated with chills and rigors. Except above mentioned symptoms. Other symptoms occurred less frequently.

#### Analysis of signs:



**Figure 2 Showing the analysis of signs in Diabetic Patients With Urinary Tract Infection**

This figure shows the analysis of signs in urinary tract infection with diabetes. On examination, pyrexia was found in 86.7% of cases. The next common signs found were dehydration and suprapubic tenderness in 26.7% and 18.3% cases, respectively. Vulvovaginal infections were found in 8.3% cases whereas an enlarged prostate was found in 6.7% cases. Incidentally, signs of peripheral neuropathy were elicitable in 43.3% cases & retinopathy is found in 13.3% cases.

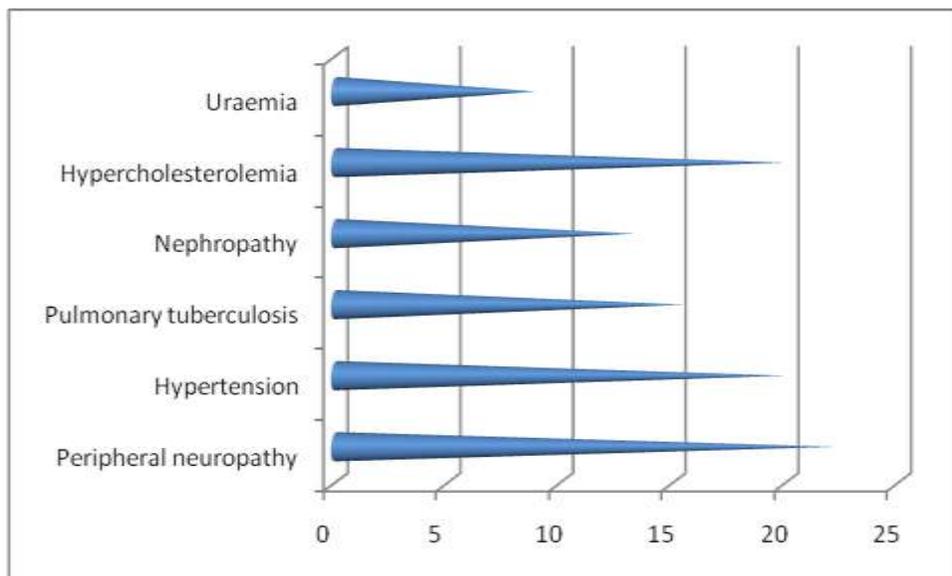
#### ORGANISM CAUSING URINARY TRACT INFECTION.

**Table.3 Showing the Organism Causing Urinary Tract Infection.**

Causative Organism	Number of patients	Percentage of patients
Escherichia coli	50	55.5%
Klebsiella	15	16.6%
Enterobacter	10	11.1%
Proteus	8	8.89%
Enterococcus	7	7.78%

The maximum number of urinary traction infections was caused by Escherichia coli group of organisms,

### ANALYSIS OF COMPLICATIONS OF DIABETES MELLITUS.



**Figure 3 showing the associated complications in diabetes mellitus with urinary tract infection.**

This figure shows the complications in patients with diabetes mellitus with urinary tract infection peripheral neuropathy and hypercholesterolemia are major complications.

### DISCUSSION:

#### Incidence:

- During the study period from Nov 2012 to April 2013 patients with diabetes mellitus with a urinary tract infection were admitted within the medical wards of Kim's Hospital out of which 90 patients were chosen based on the inclusion and exclusion criteria mentioned.
- The present study revealed the incidence of urinary tract infection to be more common in females (78.1% vs. 21.8%). The cause for this, being the same factors that increase the incidence of urinary tract infections in females in general population.
- The results of present study revealed that maximum incidence of urinary tract infections was in the age group beyond 50 years about 34.4%.

#### Duration of Diabetes

- In this study, highest incidence was found in patients who had diabetes for more than 10 years (43.3%) and least incidence with diabetics with less than 5 years duration (21.1%).

#### Symptoms and signs:

- The present study revealed fever (86.7% of cases) and increased frequency of micturition, 80 %, followed by dysuria (71.7%) as the commonest presenting symptoms. G. Mombelli et al<sup>15</sup> found that at presentation, fever was present in 86% of the patients. Thus the results of present study by correlate well with the above study.
- The analysis of present study revealed pyrexia, dehydration and suprapubic tenderness as the commonest clinical signs occurring in 86.7%, 26.7% and 18.3% of cases respectively. G. Mombelli et al had found pyrexia as the commonest sign in 86% cases, closely matching with this study<sup>15</sup>. Vulvovaginal infections were found in 8.3% cases whereas an enlarged prostate was found in 6.7% cases. Martina Franz et al found that 48% of women aged 55-85 had urogenital problems<sup>16</sup>.
- Incidentally, signs of peripheral neuropathy were elicitable in 43.3% cases. Abdul Hamid Zargar et al<sup>17</sup> reported that peripheral neuropathy was seen in 50.6% cases. M Beylot had postulated that the presence' of residual urine was strongly associated with peripheral neuropathy<sup>18</sup>, and hence this might be a factor in urinary infections in diabetics.

#### **Organism causing urinary tract infection.**

Organism causing urinary tract infection in majority of the patients is Esch. Coli is 55.5%

#### **Analysis of Complications of Diabetes Mellitus**

The major Complications in urinary tract infection with diabetes are peripheral neuropathy and hypercholesterolemia

#### **CONCLUSIONS**

A study of 90 cases of urinary tract infection in patients with diabetes mellitus has been presented with special reference to epidemiological aspects. The present study revealed the incidence of urinary tract infection to be more common in females underlining the fact that females are more prone to infection (Male: Female — 1:2.3). The incidence of urinary infection was progressively higher with the duration of diabetes mellitus, with most infections occurring beyond 10 years of diabetes. Patients most commonly presented with fever, increased frequency of micturition and dysuria and were found to have pyrexia, dehydration and suprapubic tenderness as the commonest clinical signs. Organism causing urinary tract infection in majority of the patients is Esch. Coli is 55.5% The major Complications in urinary tract infection with diabetes are peripheral neuropathy and hypercholesterolemia.

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