



# African Journal of Biological Sciences



## Occurrence Of Uropathogens Among Diabetic And Non-Diabetic Patients In Surat Region, Gujarat.

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### Article History

Volume 6, Issue 03, 2024

Received: 17 Jan 2024

Accepted : 03 Feb 2024

Doi :10.33472/AFJBS.6.03.2024.174-180

### ABSTRACT

**Introduction:** Urinary tract infections are a serious health issue that affects individuals of all ages. After respiratory tract infections, urinary tract infections rank as the second most common illness. People with diabetes experience more UTI-related issues than people without diabetes because bacteria can easily grow in the glucose-supplied medium.

**Aims and Objectives:** The purpose of this study is to identify and evaluate the presence of uropathogens in urinary tract infected patients amongst diabetics and non-diabetics.

**Material and Methods:** In this comparative study clinical and microbiological aspects of UTI were compared with diabetic and non-diabetic patients. UTI screening was conducted with midstream urinary samples and demographic characteristic, clinical profile and microscopy findings were recorded. Data were input and analyzed by using STATA 14.2 for comprehensive statistical evaluation.

**Results:** 347 individuals reported positive for UTI out of 1048 total samples. 106 (30.5%) of them were non-diabetics and 241 (69.5%) were diabetics. The risk of UTI was higher in diabetic than non-diabetic group. The most prevalent uropathogens in both non-diabetics (48%) and diabetics (40%) was *E. coli*. *Pseudomonas spp.* 15% in diabetics and 10% in non-diabetics and *Candida spp.* 15% in diabetics and 9% in non-diabetics.

**Conclusion:** Frequency of Urinary tract infections are more in diabetics than non-diabetics. Occurrence of *E. coli* was found more in non-diabetic compare to diabetic (48%vs40%). Where as *Candida spp.* was more prevalent in diabetic compare to non-diabetic (15%vs09%). Isolation rate of *Pseudomonas spp.* was higher in non diabetic compare to diabetic(10%vs03%). Higher prevalence of UTI was present in non-diabetic female compare to diabetic female (60.3%vs55.60%) and it was higher in diabetic male compare to non-diabetic male (44.3%vs39.6%).

**Key Words:** Urinary Tract Infection, Uropathogens, Diabetics, Non-diabetics.

### INTRODUCTION

A urinary tract infection is caused by microbial invasion of the urinary system, which spreads from the kidney's renal cortex to the urethral meatus. It is most common bacterial infection that

needs medical attention is the second most prevalent illness in the community, following respiratory tract infections. A higher occurrence can be caused by factors such as female hormone swings, close proximity to the anus and a thin urethra<sup>1</sup>. Diabetes mellitus increases the risk of urinary tract infections<sup>2</sup>. Diabetes raises the risk of bacteriuria because it combines local and host risk factors<sup>3</sup>. Due to compromised immunity, diabetics have a higher incidence of UTIs<sup>4</sup>. The medium that glycosuria provides can support the growth of bacteria. Diabetes patients have altered leukocyte adhesion, chemo taxis, polymorph nuclear leukocyte activity, and phagocytosis. When microorganisms attach themselves more easily to cell receptors made of carbohydrates, they become more harmful in situations where glucose levels are higher<sup>5</sup>. The most common uropathogens causing urinary tract infections (UTIs) in persons with and without diabetes is *E. coli*. Resistance to drugs in uropathogens increases the frequency of UTIs. Fungal infections are not common causes of urinary tract infections (UTIs) in healthy people, but they are common in patients with predisposing diseases and urinary tract physiological abnormalities. Fungal infections are uncommon causes of UTIs in healthy individuals, but they are common in patients with predisposing illnesses and structural abnormalities of the urinary tract<sup>8</sup>. Although bacterial infections responsible for most UTI complications in diabetic patients, the presence of *Candida* species in urine presents a diagnostic challenge<sup>9</sup>. The present guidelines do not distinguish between patients with and without diabetes mellitus when it comes to treatment recommendations. Despite the fact that it is widely recognized that DM patients experience more severe and frequent UTIs<sup>10,11</sup>. Moreover, improper use of antibiotics often leads to uropathogens becoming increasingly resistant to most commonly used antimicrobial medications<sup>12</sup>. Analyzing the incidence of prevalent uropathogens and the pattern of antibiotic susceptibility for bacterial isolates in individuals with and without diabetes who have associated risk factors is the aim of their research.

## METHODOLOGY

### Sample Collection:

This comparative study was conducted from Nov–2021 to Nov–2023. A total of 1048 samples were collected from the Smimer Medical College (SMIMER), Surat, Gujarat, India, as well as the Heer, Saad, Aarogya, and Stem laboratory. After getting their health history and permission. Patients with and without diabetes were screened and after getting their consent, demographic data was collected, including age (between 20 and 60), sex, and occupation. The study does not include patients who are younger than 20 years old, pregnant women, or patients on wheelchair. Urine and blood samples were collected for the test. In sterile urine containers, the patient's midstream urine was collected. Each sample was sent immediately to the laboratory, where it was processed with standard operating standards and kept at 40 degrees °C for subsequent examination<sup>16</sup>.

### Urine analysis:

Under sterile conditions, urine samples were divided into two parts, one for urinalysis and the other for culture. Urinary culture analysis, for identification of the uropathogens.

### Isolation and identification of Uropathogens :

Each urine sample was prepared using blood, nutrient, and Mac Conkey agars, and it was then incubated at 37° C<sup>6</sup> for the full night. The isolates were identified by colony morphology, standard biochemical methods such as the Indole test, MR test, Voges – Proskauer reaction, TSI (Triple Sugar

Iron), Citrate test, Urease test, Motility, PPA (Phenyl Pyruvic acid) test<sup>7</sup>, and Gram's staining. For identification of fungus Hichrome and Sabaroud dextrose agar were used.

**Statistical analysis:**

All data of the study was tabulated and analyzed scientifically by using STATA 14.2.

**RESULTS**

A total number of 347 culture positive patients were studied, out of them 106 (30.5%) were non-diabetic patients and 241 (69.5%) were diabetic patients examined for uropathogens. Table 1 shows the sociodemographic data of (n=106) non-diabetic patients and (n=241) diabetic patients were examined for uropathogens.

Socio-demographic Characteristics	Classification of variables	Frequency No. (%)	
		DM	NDM
Age	20-30	19(7.8%)	23(21.6%)
	30-40	62(25.7%)	22(20.7%)
	40-50	74(30.7%)	31(29.2%)
	50-60	86(35.6%)	30(28.3%)
Sex	Male	107(44.3%)	42(39.6%)
	Female	134(55.6%)	64(60.3%)
IPD	Male	44(18.2%)	21(19.8%)
	Female	59(24.4%)	27(25.4%)
OPD	Male	63(26.1%)	21(19.8%)
	Female	75(31.1%)	37(34.9%)
Duration of diabetes (in years)	<1	59(24.4%)	68(64.1%)
	1 to 2	134(55.6%)	14(13.2%)
	>2	48(19.9%)	24(22.6%)
History of Previous UTI	Yes	56(23.2%)	28(26.4%)
	No	185(76.7%)	78(73.5%)
History of previous antibiotic	Yes	80(33.1%)	60(56.6%)
	No	161(66.8%)	46(43.3%)
Blood glucose level (mg/dL)	<126	33(13%)	Not applicable
	>126	208(86.3%)	Not applicable

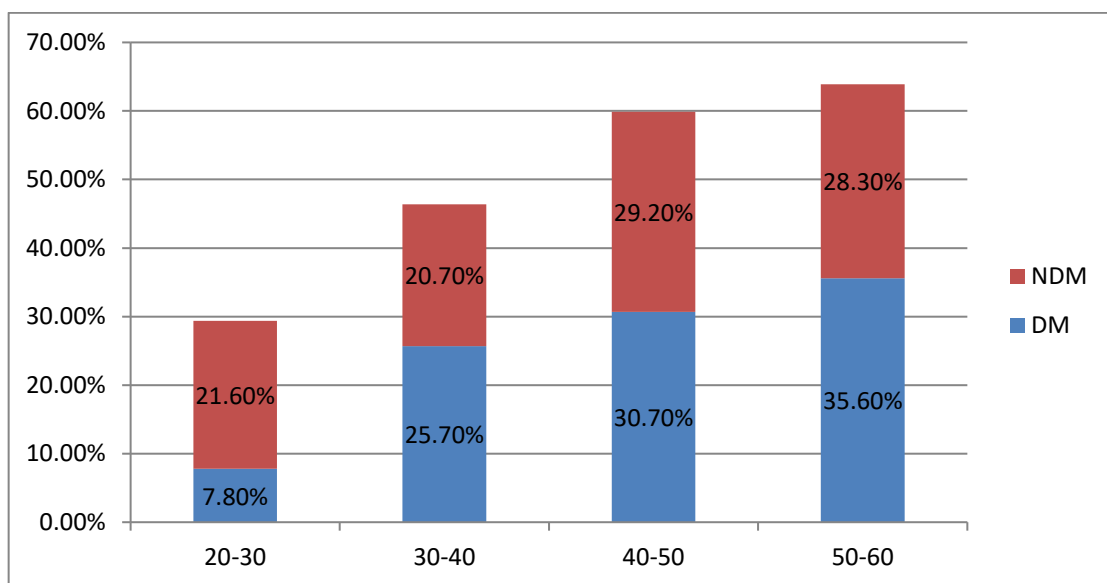
**Table 1:** Sociodemographic data of non-diabetic patients and diabetic patients for uropathogens. So far, 1048 patients have been enrolled in this study. Out of the 241 diabetic patients with UTI, 134 /241 (55.6%), were female and 107 /241 were diabetic male (44.3%). Similarly out of 106 non-diabetic patients who had UTIs, 64/106 (60.3%) were females and 42/106 were non-diabetic male (39.6%). Greater than half 134/241 (55.6%) of the study subjects were female, with a female to male ratio of 1:2:1. The mean age group of was 46.95±9.51 years (20 to 60 years). Out of the study's total participants 160/241(66.3%) of them were 40+ age category. About 48/241 individuals (19.9%) had a history of diabetes spanning at least two years. The participant's blood glucose level was <126 mg/dL in 33/241 (13.6%) and >126 mg/dL in 208/241 (86.3%).

Table 2. Displays the gender wise distribution of UTI in both diabetics and non-diabetics. Out of the 241 diabetics, 134 were female (55.6%) and 107 were male (44.3%). Out of the 106 non-diabetics, 64 were female (60.3%) and 42 were male (39.6%). In both groups, it demonstrates that females had a higher prevalence of UTI. which is comparable to research conducted by Rajat Prakash et al.<sup>15</sup>, Pooja T. Bamnote et al.<sup>14</sup>, and Vibhuti A. Zankat et al.<sup>13</sup>. However, it is contrast with Vibhuti A. Zankat et al.<sup>13</sup>.

Study Series	Year	Diabetic Male (%)	Diabetic Female (%)	Non diabetic Male (%)	Non diabetic Female (%)
Vibhuti A. Zankat et al <sup>13</sup>	2023	45.6%	54.4%	43.6%	56.4%
Pooja T. Bamnote et al <sup>14</sup>	2018	9.09%	21.18%	10%	13.76%
Rajat Prakash et al <sup>15</sup>	2014	52%	48%	46%	54%
Present Study	2023	44.39%	55.60%	39.6%	60.3%

**Table 2:** UTI distribution by gender in diabetic and non-diabetic patients.

Chart 1. shows the wide range of the non-diabetic individuals were 40-50 years (30.7%) while, the diabetic participants were between 50 to 60 years (35.6%). The age specific UTI distribution in people with and without diabetes is displayed in Chart 1.



**Chart 1:** Age-specific UTI distribution in diabetics and non-diabetic patients.

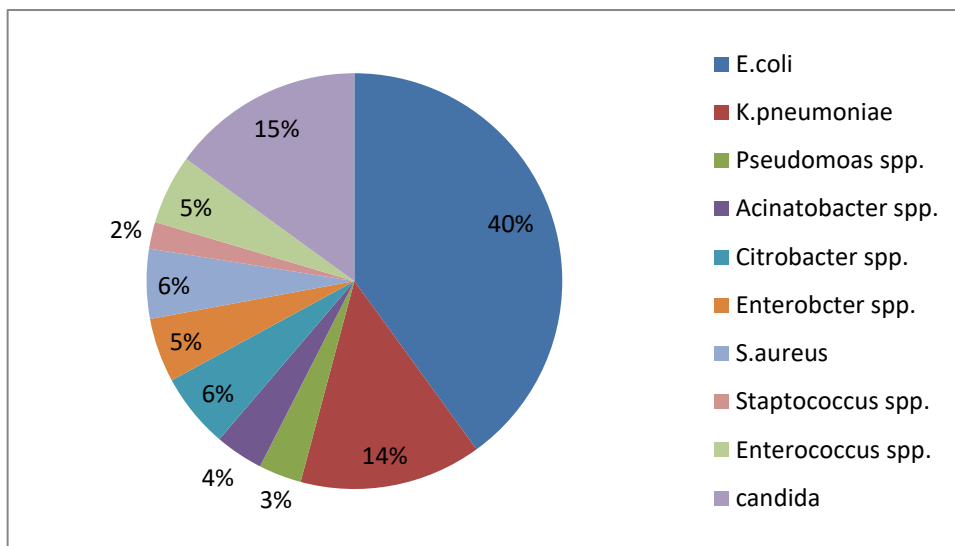
The micro organisms isolated from the urine cultures are listed in Chart 2 and 3. The most common organism isolated among both diabetics and non-diabetic patients was *E.coli*. A higher isolation rate of *Pseudomonas spp.* in non diabetic patients was (10%). (P < 0.05) p value is significant which is comparable with Australas Med J et.al 2014<sup>16</sup>. Same as *Klebsiella spp.*, *Acinetobacter spp.*, *Citrobacter spp.*, *Staphylococcus Spp.*, *Staptococcus spp.*, *Enterococcus spp.*, *Enterobacter spp.* and fungus *Candida* was higher in diabetic than non diabetic patients. Which shows in Table 3.

Organisms	DM N=241	NDM N=106	p-value

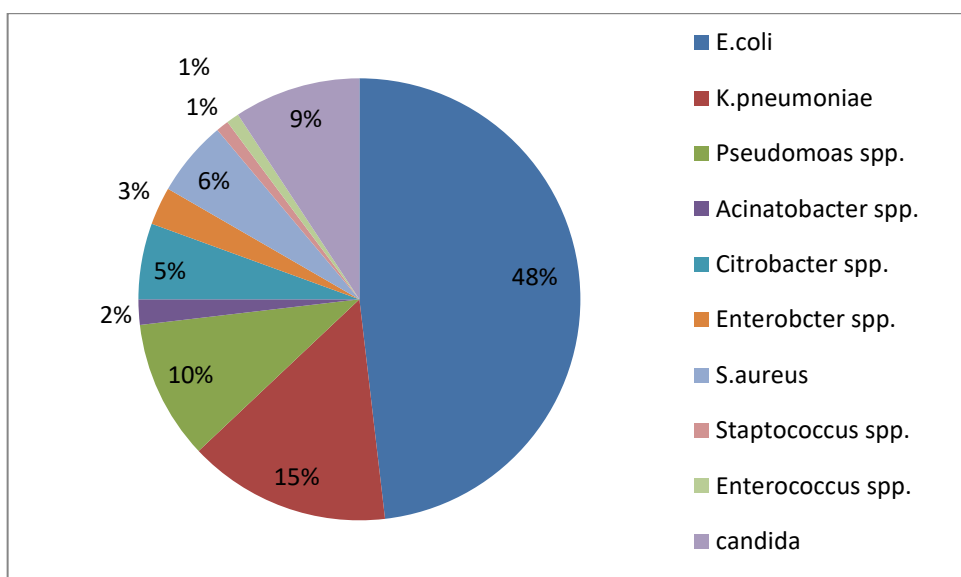
<i>E.coli</i>	97	51	<0.001
<i>Klebsiella spp.</i>	34	15	0.004
<i>Pseudomonas spp.</i>	8	11	0.881
<i>Acinobacter spp.</i>	9	2	0.013
<i>Citrobacter spp.</i>	14	6	0.017
<i>Staphylococcus aureus</i>	13	6	0.02
<i>Staptococcus spp.</i>	5	1	0.092
<i>Enterococcus spp.</i>	13	1	<0.001
<i>Enterobacter spp.</i>	12	3	0.004
Candida spp.	36	10	0.005

p value < 0.05 = significant

**Table 3: Organisms isolated from urine cultures.**



**Chart 2: Isolation of different Uropathogens in diabetic patients.**



**Chart 3: Isolation of different Uropathogens in non-diabetic patients.**

## CONCLUSIONS

According to this study, patients with diabetes had a higher rate of UTIs than patients without the disease. *E. coli* was detected in non-diabetic patients at a higher rate (48%vs40%) than in diabetic patients. Conversely, the prevalence of *Candida* was higher in persons with diabetes than in those without it (15%vs09%). *Pseudomonas spp.* isolation rates were greater in non-diabetics (10%vs03%) than in diabetics. There was no significant variation in *Klebsiella spp.* In both groups, non-diabetic females had a greater prevalence of UTI than diabetic females (60.3% vs55.60%), while diabetes males had a higher prevalence of UTI than non-diabetic males (44.3% vs39.6%). UTIs are more prevalent in those between the ages of 50 and 60 (35%).

## CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

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