



## Assessment of Prevalence and Associated Risk Factors of Urinary Tract Infection among Diabetic Patients in a Tertiary Care Centre

<sup>1</sup>T.G. Ramya, <sup>2</sup>Meghna Mohan, <sup>3</sup>S. Pravin Dass and <sup>4</sup>V. Balaji Tulse Dass

<sup>1</sup>Department of Microbiology, Karuna Medical College Vilayodi Chittur Palakkad, India

<sup>2</sup>Department of General Medicine, Karuna Medical College Vilayodi Chittur Palakkad, India

<sup>3</sup>Department of General Surgery, Karuna Medical College, Vilayodi, Chittur Palakkad, India

<sup>4</sup>Department of General Medicine, Karuna Medical College, Vilayodi Chittur, Palakkad, India

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#### Corresponding Author

V. Balaji Tulse Dass,  
Department of General  
Medicine, Karuna Medical College  
Vilayodi Chittur Palakkad, India  
dr-venkatbalaji@yahoo.co.in

#### Author Designation

<sup>1-4</sup>Associate Professor

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#### Abstract

To assess the prevalence and associated risk factors of urinary tract infection among diabetic patients. One hundred two patients, aged 18 to 60 years diagnosed with Type I, Type II and gestational diabetes of both genders were enrolled. Parameters such as BMI, educational qualification, and clinical profiles of DM and UTI were recorded. Other risk factors of UTI infection were also recorded. Demographic analysis showed that 8 patients were in the age group of 18-28 years, 22 patients were in the age group of 28-38 years, 42 patients were in the age group of 38-48 years and 30 patients were in the age group of 48-60 years. The difference was significant ( $P < 0.05$ ). Out of the 102 patients enrolled, 32 were illiterate, 38 attended primary school, 18 attended secondary school and 14 patients were graduates. The prevalence of Type I DM in this study was 24.5%, Type II DM was seen in 58.8% and gestational diabetes was noted in 16.6%. Duration of DM was  $< 5$  years in 26 patients, 5-10 years in 52 patients and  $> 10$  years in 24 patients. BMI was  $< 25$  in 35 patients, 26-35 in 11 patients and  $> 36$  in 56 patients. HbA1C was increased in 76 patients and normal in 26 patients. Uropathogens isolated were E. Coli in 59, Klebsiella spp. in 12, Citrobacter spp. in 7, Proteus spp. in 3, E. faecalis in 17 and S. aureus in 4 patients. The difference was significant ( $P < 0.05$ ). UTI was present among 45 (46%) patients. Symptoms of UTI was abdominal pain in 32, frequent micturition in 15, burning micturition in 42, high fever in 18, loin pain in 13, and nausea and vomiting in 27. Complications were seen among 18 patients. The difference was significant ( $P < 0.05$ ). Crude odds ratio (COR) for risk factors of UTI was female gender (2.67), marital status single (0.58), educational level illiterate (1.03), Type of diabetes Type II (1.27), BMI  $> 36$  (2.84). The female gender has a higher risk of UTIs among people with diabetes. Other risk factors were high BMI, Type II Diabetes, uncontrolled DM., Higher HbA1C values and illiteracy. High HbA1c is associated with increased urinary tract infection.

## INTRODUCTION

The most prevalent endocrine disease as well as the most common non communicable disease of the present century is diabetes. A number of variables including changes in lifestyle have led to the increasing prevalence of diabetes in emerging nations. In recent years, the incidence of diabetes has become more common<sup>[1]</sup>. According to estimates from the International Diabetes Federation, In 2021, the estimate was that there were 536.6 million people with diabetes (uncertainty interval: 424.2-612.3 million) among adults ages 20-79 in in 215 countries and territories. and if preventive measures are not taken, this figure is expected to rise to 643 million by 2030 and 783 million by 2045<sup>[2]</sup>.

Approximately 79% of people with diabetes worldwide reside in low-and middle-income nations. Diabetes leads to a number of ailments more commonly, including urinary tract infections and eye infections, lower limb amputation and cardiovascular and eye problems like scleritis, retinopathy<sup>[3]</sup>. Compared to individuals without diabetes, patients with diabetes

Have an increased chance of developing any infection, including lower respiratory tract infections, urinary tract infections, sepsis, endocarditis, skin, bone, joint, and mucous membrane infections<sup>[4]</sup>.

Patients with diabetes who have poor glycemic control are more likely to have serious infections., Hence they should take extra precautions to avoid infections than the general public. UTI account for 1-6% of all medical referrals<sup>[5]</sup>. In diabetes patients, urinary tract infection (UTI) accounts for the most common infectious disease. Globally, UTIs and their consequences cause approximately 150 million deaths annually. Current data show that UTIs are the most common bacterial infection among diabetic individuals<sup>[6]</sup>. We performed this study to assess prevalence and associated risk factors of urinary tract infection among diabetic patients.

## MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from the ethical review committee, we selected one hundred two patients, aged 18-60 years diagnosed with Type I, Type II and gestational diabetes of both genders.

Data such as name, age, gender etc. was recorded. Parameters such as BMI, educational qualification, and clinical profiles of DM and UTI was recorded. Other risk factors of UTI infection was also recorded. The results were compiled and subjected to statistical analysis using the Mann- Whitney U test.  $P < 0.05$  was regarded as significant.

## RESULTS AND DISCUSSIONS

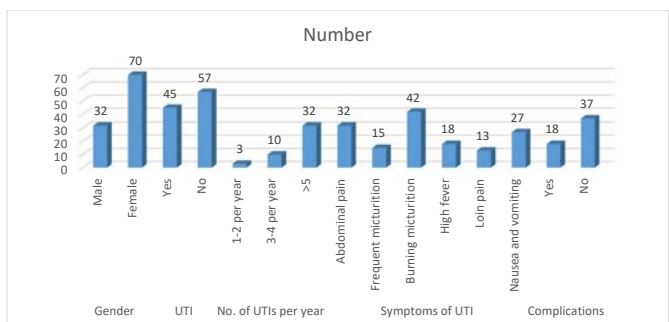
Age group 18-28 years had 8, 28-38 years had 22, 38-48 years had 42 and 48-60 years had 30 patients. The difference was significant ( $P < 0.05$ ) (Table I).

Educational qualification of patients showed that out of the 102 patients enrolled, 32 were illiterate, 38 attended primary school, 18 attended secondary school and 14 patients were graduates. The prevalence of Type I DM in this study was 24.5%, Type II DM was seen in 58.8% and gestational diabetes was noted in 16.6%. Duration of DM was  $< 5$  years in 26, 5-10 years in 52 and  $> 10$  years in 24. BMI was  $< 25$  in 35, 26-35 in 11 and  $> 35$  in 56 patients. HbA1C was increased in 76 patients and normal in 26 patients. Uropathogens isolated were *E. Coli* in 59, *Klebsiella* spp. in 12, *Citrobacter* spp. in 7, *Proteus* spp. in 3, *E. faecalis* in 17 and *S. aureus* in 4 patients. The difference was significant ( $P < 0.05$ ) (Table I).

UTI was seen among 45 (46%) patients. No. of UTIs per year was 1-2 seen in 3, 3-4 in 10 and  $> 5$  in 32 patients. Predominant Symptoms of UTI was abdominal pain in 32, frequent micturition in 15, burning micturition in 42, high fever in 18, loin pain in 13, and nausea and vomiting in 27. Complications were seen among 18 patients. The difference was significant ( $P < 0.05$ ) (Table II, Graph I).

Crude odds ratio (COR) for risk factors of UTI was female gender (2.67), marital status single (0.58), educational level illiterate (1.03), Type of Diabetes Type II (1.27), BMI  $> 36$  (2.84) and uncontrolled HbA1C (2.30).

An infection that develops in the urinary tract is known as a urinary tract infection (UTI)<sup>[7,8]</sup>. UTIs are more common in women than in males and bladder infections can be excruciatingly painful. However, when the infection advances to the kidneys, a UTI can have major repercussions<sup>[9,10]</sup>. Urinary tract infections in diabetic individuals can be brought on by a number of factors, including decreased immune system disorders, decreased white blood cell counts, inadequate blood supply, bladder dysfunction from nephropathy, and glycosuria.



Graph 1: Characteristics of UTI among the patients

**Table 1: Patients distribution**

Age group (years)	Number	p-value
18-28	8	0.72
28-38	22	
38-48	42	
48-60	30	

\*Statistically Significant

**Table 2: Baseline characteristics**

Parameters	Variables	Number	p-value
Educational			
Qualification	Illiterate	32	0.84
	Primary	38	
	Secondary	18	
	Graduate	14	
Type of diabetes	Type I	25	0.02
	Type II	60	
	Gestational diabetes	17	
Duration of DM	<5 years	26	0.05
	5-10 years	52	
	>10 years	24	
BMI	<25	35	0.75
	26-35	11	
	>36	56	
HbA1C	Increased	76	0.01
	Normal	26	
Uropathogens	E. Coli	59	0.02
	Klebsiella spp	12	
	Citrobacter spp.	7	
	Proteus spp.	3	
	E. faecalis	17	
	S. aureus	4	

\*Statistically Significant

**Table 3: Characteristics of UTI among the patients**

Parameters	Variables	Number	p-value
Gender	Male	32	0.02
	Female	70	
UTI	Yes	45	0.84
	No	57	
No. of UTIs per year	1-2	3	0.01
	3-4	10	
	>5	32	
Symptoms of UTI	Abdominal pain	32	0.85
	Frequent micturition	15	
	Burning micturition	42	
	High fever	18	
	Loin pain	13	
	Nausea and vomiting	27	
Complications	Yes	18	0.01
	No	37	

\*Statistically Significant

**Table 4: Risk factors of UTI**

Factors	Categories	COR
Gender	Male(ref)	
	Female	2.67
Educationlevel	Illiterate	1.03
	Primary	0.72
	Secondary	0.81
	Degree	0.94
Type of diabetes	Type I (ref)	
	Type II	1.27
	Gestational diabetes(ref)	
BMI	<25(ref)	
	26-35	1.70
	>36	2.84
HbA1C	Controlled (ref)	
	Uncontrolled	2.30

Dysuria is a consequence of UTI that can occur in diabetic people because of organ damage and possibly fatal situations<sup>[11]</sup>. We performed this study to assess prevalence and associated risk factors of urinary tract infection among diabetic patients.

In our study, Type of diabetes was Type I in 25, Type II in 60 and gestational diabetes in 17, Duration of DM was <5 years in 26 patients, 5-10 years in 52 patients and >10 years in 24 patients. BMI was <25 years in 35 patient, 26-35 years in 11 patient and >36

years in 56 patients. HbA1C was increased in 76 patients and normal in 26 patients. Uropathogens isolated were *E. Coli* in 59, *Klebsiella* spp. in 12, *Citrobacter* spp. in 7, *Proteus* spp. in 3, *E. faecalis* in 17 and *S. aureus* in 4 patients. Tegegne<sup>[12]</sup> estimated the prevalence of urinary tract infection and its associated factors. 14 of the 1128 studies that were evaluated satisfied our requirements and were added to the analysis. 3773 individuals in all were enrolled in the study. According to estimates, the prevalence of UTIs was 15.97% (95% CI: 12.72–19.23). Subgroup analysis revealed that the SNNP region (19.21%) and research carried out in and after 2018 (17.98%) had the highest prevalence. Urinary tract infection was predicted by gender (AOR = 3.77., 95% CI: 1.88, 5.65), illiteracy (AOR = 5.29., 95% CI: 1.98, 8.61) and history of urinary tract infection (AOR = 3.04., 95% CI: 2.16–3.92).

It was found that the UTI was seen among 45 (46%). No. of UTIs per year was 1-2 seen in 3 patients, 3-4 in 10 patients and >5 in 32 patients. Symptoms of UTI was abdominal pain in 32 patients, frequent micturition in 15 patients, burning micturition in 42 patients, high fever in 18 patients, loin pain in 13 patients and nausea and vomiting in 27 patients. Complications were seen among 18 patients. Ahmed<sup>[13]</sup> in their study found that Types 1 and 2 DM incidence were 60.9 and 5%, respectively. Sixty-five percent of the participants had first-degree relatives who had diabetes. A common UTI affected 39.3% of the individuals. A chi-squared statistical analysis showed that the Type of DM had an impact on the frequency of UTI ( $\chi^2 = 5.176$ ,  $P = 0.023$ ). Abdominal pain and burning when urinating were the most prevalent symptoms. The cumulative odds ratios (CORs) for sex, marital status, hypertension, and BMI were 2.68 (95% CI = 1.78-4.02), 0.57 (95% CI = 0.36-0.92), 1.97 (95% CI = 1.14-3.43) and 2.83 (95% CI = 1.19-2.99), respectively, and all significant ( $P < 0.05$ ). The modified model indicated that the single factor influencing the likelihood of UTIs was sex. AOR for sexual orientation was 3.45 (CI = 2.08-5.69).

We found that crude odds ratio (COR) for risk factors of UTI was female gender (2.67), marital status single (0.58), educational level illiterate (1.03), Type of diabetes Type II (1.27), BMI >36 (2.84). Mama<sup>[14]</sup> elucidated the prevalence of UTI, associated factors, causative agents. The study comprised 239 diabetes patients in total, with 60.2% ( $n=144$ ) of them being female. Urine cultures came up positive in 81 (33.8%) diabetic individuals overall. Significant bacteriuria was found in sixty-eight (83.9%) of the female diabetic patients ( $p=0.000$ ). Of the respondents, 79 (97.5%) had higher glucose levels ( $=126$  mg/dL) than the 52 (64.1%) participants ( $p=0.004$  and  $p=0.003$ ). Eight species of uropathogens, including *Escherichia coli*, *Klebsiella* sp.,

*Proteus* sp., *Citrobacter* spp., *Staphylococcus aureus*, Coagulase negative *Staphylococcus* (CNS), *Enterococcus faecalis*, and yeast isolates, were identified in a total of 90 isolates from patients with significant bacteriuria, based on the results of the biochemical tests. High levels of resistance to penicillin and trimethoprim (100%,  $n = 24$ ) and amoxicillin (83.3%,  $n = 20$ ) and gentamicin (62.5%,  $n = 15$ ) were seen in the Gram-positive bacteria. All of the Gram-positive cocci and Gram-negative bacilli were consistently (100%) sensitive to nitrofurantoin, amikacin, doxycycline and ceftriaxone.

## CONCLUSION

The female gender has a higher risk of UTIs among people with diabetes. Other risk factors were high BMI, Type II Diabetes, uncontrolled glycemic control inferred by higher HbA1C levels and illiteracy. High HbA1c is associated with increased incidence of urinary tract infection.

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