



Original Research Article

A study of clinical and laboratory profile of UTI in diabetics in Sir T. Hospital, Bhavnagar — observational cross-sectional study

Kinjal Modi^{1,*}, Jatin Sharma¹, Hirava Munshi², Shrey Panjwani²

¹Dept. of General Medicine, Government Medical College, Bhavnagar, Gujarat, India

²Dept. of General Medicine, B.J. Medical College, Ahmedabad, Gujarat, India



ARTICLE INFO

Article history:

Received 04-12-2022

Accepted 07-01-2023

Available online 13-02-2023

Keywords:

Urinary Tract Infections

Doxycycline

Ceftazidime

ABSTRACT

Introduction: Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycaemia caused by defects in insulin secretion, action, or both. Immune dysfunction is a major issue in the disease course, and it can manifest as either autoimmune disease or a poor immune response, the latter of which leads to a higher incidence of infections. The link between a higher incidence of urinary tract infections (UTI) and diabetes has been attributed to immune system impairments, poor metabolic control, and incomplete bladder emptying due to autonomic neuropathy. Poor glycaemic control may predispose to more severe UTI and greatly increase the risk of complications in UTI.

Materials and Methods: 200 diabetic patients were screened for UTI admitted at Sir T. General Hospital, Bhavnagar over the period of 6 months from 1st November 2021 to 30th April 2022. The various measures of central tendencies and graphical representations were used to analyse the data.

Results: Majority subjects were from age group of 46 – 60 years 74 (37%) followed by 31-45 years 59 (29.5%), > 60 years was 44 (22%) and 18-30 years was 23 (11.5%) respectively. It was found that female patients 103 (51.5%) marginally higher than male 97 (48.5%). The ratio of male: female was 1:1.06.

Conclusion: UTI was found to be significantly associated with advanced age and poorly controlled Diabetes.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycaemia caused by defects in insulin secretion, action, or both. Immune dysfunction is a major issue in the disease course and it can manifest as either autoimmune disease or a poor immune response, the latter of which leads to a higher incidence of infections. Infections most commonly affect the urinary tract in diabetes. Indeed, cystitis is the most common infection in diabetes, outnumbering respiratory tract infections such as acute rhinitis and acute bronchitis, as well as skin infections such as dermatomycoses.¹ The link between

a higher incidence of urinary tract infections (UTI) and diabetes has been attributed to immune system impairments, poor metabolic control and incomplete bladder emptying due to autonomic neuropathy.² Age, glycaemic control and long-term complications, primarily diabetic nephropathy and cystopathy were also found to increase the risk of UTI in diabetics.³ Poor glycaemic control may predispose to more severe UTI and greatly increase the risk of complications in UTI.⁴ Invariably, E. Coli is the most common isolate in UTI in DM. Other pathogens commonly isolated include Klebsiella, Proteus and Staphylococcus aureus.⁵ The high rates of antibiotic prescription for UTI in these patients may further induce the development of antibiotic-resistant urinary pathogens.⁶

* Corresponding author.

E-mail address: drhetvichawda@gmail.com (K. Modi).

2. Objectives

To assess clinical profile of UTI in diabetics, to assess laboratory profile of UTI in diabetics, to assess common causative organisms and their antibiotic sensitivity pattern.

3. Material and Methods

200 diabetic patients were screened for UTI admitted at Sir T. General Hospital, Bhavnagar over the period of 6 months from 1st November 2021 to 30th April, 2022.

3.1. Inclusion criteria

All the Diabetic patient ≥ 18 years Symptomatic and/or diagnosed with UTI.

3.2. Exclusion criteria

1. Pregnant and lactating mothers.
2. Immunocompromised patients (transplant patients, patients on immunosuppressive therapy, HIV patients)
3. Catheter associated UTI
4. Diabetic patients who are on SGLT2 inhibitor.
5. The various measures of central tendencies and graphical representations were used to analyse the data.

3.3. Diagnosis of diabetes mellitus was made using the following criteria

1. Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dL) or,
2. Symptoms of diabetes plus random blood glucose concentration ≥ 11.1 mmol/L (200 mg/dL) or,
3. Two-hour plasma glucose ≥ 11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test or,
4. HbA1C $> 6.5\%$.

A detailed examination of all systems with special emphasis on temperature, pulse rate, blood pressure, suprapubic tenderness, costovertebral angle tenderness, tenderness/mass on deep abdominal palpation were carried out.

Collection of mid-stream urine. Urine samples were sent to laboratory immediately for routine evaluation and for culture. For culture urine samples were incubated at 37C for 24 to 48 hrs in Blood / Chocolate agar and Mac Conkeys agar plate. Organisms identified were based on colony characteristics, lactose fermentation and biochemical test. Sensitivity to common antibiotics was done in all positive cultures. Other investigations included Complete blood count also done.

4. Results

In the present study, Majority subjects were from age group of 46 – 60 years 74 (37%) followed by 31-45 years 59 (29.5%), > 60 years was 44 (22%) and 18-30 years was 23 (11.5%) respectively.

In gender wise distribution, it was found that female patients 103 (51.5%) marginally higher than male 97 (48.5%). The ratio of male: female was 1:1.06. Majority of patient's duration of diabetes between 6 to 10 years comprised 88 (44%).

Duration was less than 5 years in 86 (43%) and more than 10 years in 26 (13%). The least duration of diabetes in the study group was 12 months and the maximum duration was of 18 years. The mean duration of diabetes was 6.67 ± 3.60 years. In the present study, in clinical symptoms fever was found in 182 (91%) patients, Burning micturition in 79 (39.5%), Abdominal pain 38 (19%) and dysuria in 35 (17.5%). In biochemical parameters it was found that abnormal FBS in 163 (81.5%), abnormal PPBS in 171 (85.5%) and abnormal Hb1Ac (%) in 193 (96.5%), anemia in 71 (35.5%) patients, Leukocytosis in 76 (38%) patients respectively.

Predominant bacteria isolated were E. Coli 141 (70.5%) and the next common being Klebsiella 30 (15%). Other organisms isolated were Pseudomonas 12 (6%), Proteus 10 (5%), Candida 4 (2%) and Enterococci 3 (1.5%). Gender based evaluation of the causative organism also showed E. Coli as the most common cause organism in females.

It was found that among all the antibiotics — Imipenem, Meropenem and Colistin were found to be the best drugs to which all the organisms isolated were sensitive and most of the organism's showed resistance to first line drugs like ciprofloxacin, nitrofurantoin, amikacin and gentamycin except E. Coli.

Table 1: Age wise distribution

Age	No of Patients (N=200)
18-30	23 (11.5%)
31-45	59 (29.5%)
46-60	74 (37%)
>60	44 (22%)
Total	200 (100%)
Mean Age (yrs)	48.36 ± 13.53

Table 2: Gender wise distribution

Gender	No of Patients (N=200)
Female	103 (51.5%)
Male	97 (48.5%)
Total	200 (100%)
M:F ratio	1:1.06

5. Discussion

For bacterial infection, urinary tract is the second commonest site after respiratory tract. Diabetes increases the risk of infection and the commonest amongst them

Table 3: Duration of diabetes mellitus

Duration of DM (years)	No of patients (n=200)
<1	0 (0%)
1-5	86 (43%)
6-10	88 (44%)
>10	26 (13%)
Total	200 (100%)
Mean duration of DM (years)	6.67 ± 3.60

Table 4: Clinical symptoms

Symptoms	No of patients (n=200)
Fever	182 (91%)
Burning micturition	79 (39.5%)
Abdominal pain	38 (19%)
Dysuria	35 (17.5%)
Urinary frequency	30 (15%)
Urinary urgency	27 (13.5%)
Pyuria	23 (11.5%)
Hesitancy	18 (9%)
Nausea	15 (7.5%)
Vomiting	12 (6%)
Nocturia	11 (5.5%)
Hematuria	8 (4%)
Diarrhoea	8 (4%)
Drowsiness	7 (3.5%)

Table 5: Laboratory parameters

Laboratory Parameters	No of patients (n=200)
FBS (mg/dL)	
<126 mg/dL	37 (18.5%)
> 126 mg/dL	163 (81.5%)
PPBS (mg/dL)	
< 200 mg/dL	29 (14.5%)
> 200 mg/dL	171 (85.5%)
Hb1AC (%)	
< 7%	7 (3.5%)
≥ 7%	193 (96.5%)
Hb (gm/dL)	
<10 gm/dL	71(35.5%)
>10 gm/dL	129(64.5%)
Total Count	
4000-11000 mm ³	124(62%)
>11000 mm ³	76(38%)
Urine Examination	
Sugar	48 (24%)
AlbuminRBC	104 (52%)
	83 (41.5%)
Casts	28 (14%)
Pus cells	200 (100%)

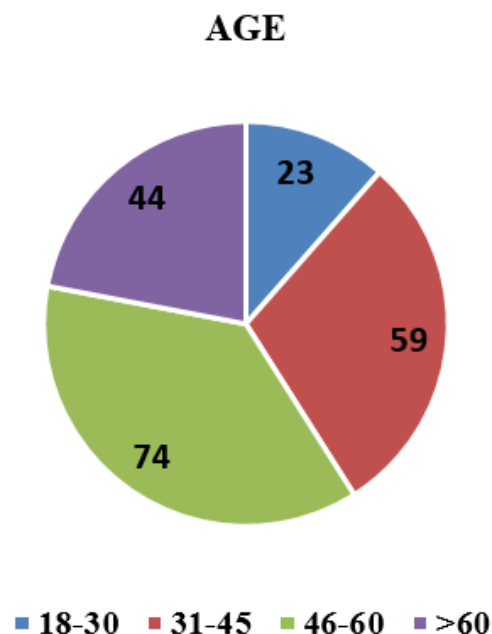
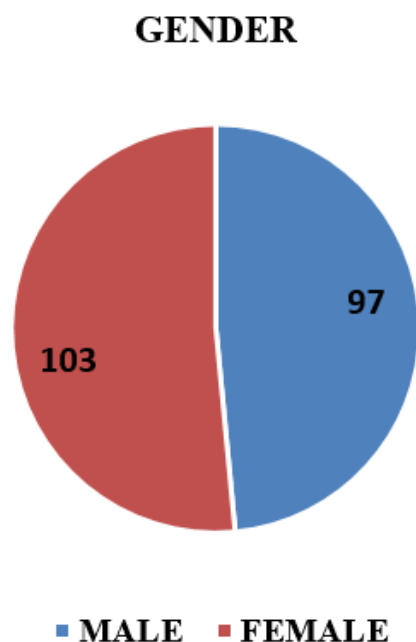
**Fig. 1:** Age wise distribution**Fig. 2:** Gender wise distribution

Table 6: Organisms isolated

Organism	No of patients (n=200)
E. Coli	141 (70.5%)
Klebsiella	30 (15%)
Pseudomonas	12 (6%)
Proteus	10 (5%)
Candida	4 (2%)
Enterococci	3 (1.5%)
Total	200 (100%)

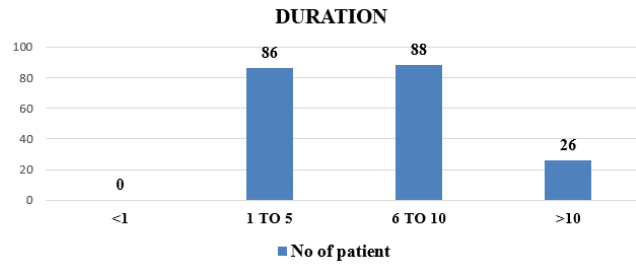


Fig. 3: Duration of diabetes mellitus

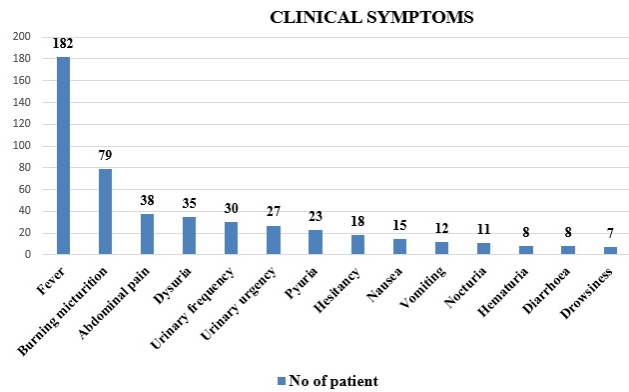


Fig. 4: Clinical symptoms

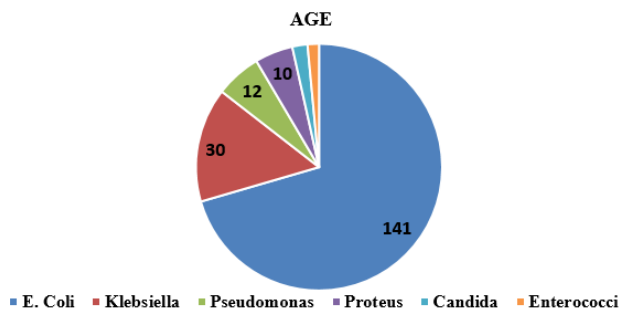


Fig. 5: Organisms isolated

Table 7: Antibiotic sensitivity to organisms

Antibiotic	E. Coli (n=141)	Klebsiella (n=30)	Pseudomonas (n=12)	Proteus (n=10)	Candida (n=4)	Enterococci (n=3)
Gentamycin	124(87.94%)	18(60%)	3(25%)	0	0	0
Amikacin	132(93.61%)	18(60%)	0	0	0	0
Colistin	138(97.87%)	28(93.3%)	3(25%)	0	0	3(100%)
Imipenem	141(100%)	30(100%)	9(75%)	10(100%)	0	3(100%)
Meropenem	123(87.23%)	30(100%)	3(25%)	7(70%)	0	2(66.6%)
Tetracycline	11(7.8%)	6(18%)	0	3(30%)	0	0
Doxycycline	8(5.67%)	22(73.3%)	0	2(20%)	0	0
Nitrofurantoin	93(65.95%)	11(36.6%)	3(25%)	5(50%)	0	2(66.6%)
Ciprofloxacin	88(62.41%)	10(33.3%)	0	0	0	0
Piperacillin + Tazobactam	67(47.51%)	11(36.3%)	0	0	0	0
Fluconazole	0	0	0	0	4(100%)	0
"Cefoperazone+ Sulbactam"	91(64.53%)	10(30%)	0	0	0	0
Ceftazidime	69(48.93%)	11(36.6%)	3(25%)	0	0	0

are the ones involving the genitourinary tract. 40% of the years of life lost in a diabetic patient on an average can be attributed to nonvascular conditions like cancers, infections, and neurodegenerative disorders.⁷

In the present study, Majority subjects were from age group of 46-60 years (37%) followed by 31-45 years (29.5%) with mean age was 48.36 ± 13.53 years respectively. Choudhary MK et al have found that the most common age group was 46–55 years in (35%) patients. While it was corresponding with other study by Prakasam KA et al the incidence of UTI in male patients was more in patients with age group of 51-60 (54.28%) and least in the age group of 21-30 (10%), among female patients' higher prevalence was observed in the age group of 31-40 (27.5%) and 51-60 (26.5%).^{8,9} Most urinary tract infections were observed mainly in women because of sexual activity and pregnancy. Prevalence in women is also due to decrease of normal vaginal flora, less acidic pH of vaginal surface, short & wide urethra, proximity of urethra to anus and poor hygienic conditions.^{10–12}

Majority of patient's duration of diabetes between 1 to 10 years comprised (87%) then > 10 years in (13%) patients with mean duration of diabetes were 6.67 ± 3.60 years. The similar study by Sylvester SJ et al have observed that patients with duration < 1 year (Newly diagnosed cases) and those with duration > 10 years (Long standing cases) had lower (21% and 17% respectively) than those who had duration of DM between 1-10 years (62%), which is correlated with present study. A study by Abdulla MC et al.¹⁰ observed increased risk of developing UTI, almost 148 (78.4%) patients with duration of diabetes >15 years and the rest had a duration lesser than 15 years (21.6%).

The study by Choudhary MK et al have found that Most of the patient had a fever with rigor (48%) followed by dysuria (22%), suprapubic pain abdomen (20%), increase frequency of urine (18%), flank pain (10%) pyuria (6%), and haematuria (4%).

Study by Abdulla MC et al have found that Gram negative bacilli were isolated from 129 (87.2%) patients which included *E. coli* in (50.7%), *Klebsiella* in (20.3%), *Pseudomonas* species in (8.1%) and *Citrobacter* in (8.1%) patients. Gram positive cocci were responsible for UTI in (10.1%) subjects including enterococcus (8.9%) and staphylococcus in (1.3%). *Candida* was isolated from (2.7%) patients.

In present study it was observed that most common isolated bacteria *E. Coli* was found sensitive against all antibiotics. Other commonly isolated Gram -ve bacteria were found mostly sensitive against Imipenem, Meropenem and Colistin. Similarly, the study by Vignesh PS et al have found that Cefoperazone, sulbactam was found to be highly sensitive antibiotic for gram positive than gram negative microorganisms^{10,11} Amikacin was found to be sensitive for both gram positive and gram-negative pathogens followed by nitrofurantoin. Moreover, the study by Abdulla MC et

al have found that gram negative bacilli including *E. coli*, the *Klebsiella* species, *pseudomonas* and *Citrobacter* had good response to piperacillin-tazobactam, cefoperazone-sulbactam, imipenam and amikacin. Our patients with gram negative bacilli UTI had an increased resistance for ampicillin and fluoroquinolones.

6. Conclusion

UTI was found to be significantly associated with advanced age and poorly controlled Diabetes. The link between a higher incidence of urinary tract infections (UTI) and diabetes has been attributed to immune system impairments, poor metabolic control and incomplete bladder emptying due to autonomic neuropathy.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

- Muller LM, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AI. Infections in patients with diabetes mellitus: A review of pathogenesis. *Indian J Endocrinol Metab.* 2005;41(1):281–9.
- Saleem M, Daniel B. Prevalence of Urinary Tract Infection among Patients with Diabetes in Bangalore City. *Int J Emerg Sci.* 2011;1(2):133–42.
- Brown JS, Wessells H, Chancellor MB. Urologic complications of diabetes. *Diab Care.* 2005;28(1):177–85.
- Nicolle LE, Friesen D, Harding GK, Roos LL. Hospitalization for acute pyelonephritis in Manitoba, Canada, during the period from 1989-1992; impact of diabetes, pregnancy, and aboriginal origin. *Clin Infect Dis.* 1996;22(6):1051–7.
- Goswami R, Bal CS, Tejaswi S. Prevalence of urinary tract infection and renal scars in patients with Diabetes mellitus. *Diab Res Clin Pract.* 2001;53(3):181–7.
- Venmans LM, Hak E, Gorter KJ, Rutten GE. Incidence and antibiotic prescription rates for common infections in patients with diabetes in primary care over the years 1995 to. *Int J Infect Dis.* 2003;13(6):344–51.
- Melmed S, Polonsky KS, Larsen PR, Kronenberg HM. Williams Textbook of Endocrinology. 14th ed. and others, editor. Elsevier Health Sciences; 2015. p. 1792.
- Choudhary MK, Kumar N, Prakash V, Mishra AK, Kumar A. Study of Urinary Tract Infection in Patients with Diabetes Mellitus. *Int J Sci Stud.* 2020;8(4):45–53.
- Prakasam KA, Kumar KD, Vijayan M. A cross sectional study on distribution of urinary tract infection and their antibiotic utilisation pattern in Kerala. *Int J Res Pharm Biomed Sci.* 2012;3(3):1125–55.
- Abdulla MC, Jenner FP, Alungal J. Urinary tract infection in type 2 diabetic patients: risk factors and antimicrobial pattern. *Int J Res Med Sci.* 2015;3(10):2576–85.
- Vignesh PS, Gopinath TT, Sriram DK. Urinary tract Infection among type 2 diabetic patients admitted in a multispecialty hospital in South Chennai, Tamil Nadu. *Int J Commun Med Public Health.* 2019;6(3):1295–300.
- Stephen SJ, Gaharwar R. Effect of glycemic control on the clinical and laboratory profile of UTI in patients with diabetes mellitus. *Int J Contemp Med Res.* 2019;6(6):1–5.

Author biography

Kinjal Modi, Resident

Jatin Sharma, Resident

Hirava Munshi, Student

Shrey Panjwani, Student

Cite this article: Modi K, Sharma J, Munshi H, Panjwani S. A study of clinical and laboratory profile of UTI in diabetics in Sir T. Hospital, Bhavnagar — observational cross-sectional study. *Ann Geriatrics Educ Med Sci* 2022;9(2):64-69.