

Study of Urinary Tract Infection in Patients with Diabetes Mellitus

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Abstract

Introduction: Urinary tract infection is one of the most common types of bacterial infection in patients with diabetes mellitus.

Aim: The aim of the study was to assess the prevalence of urinary tract infection among hospitalized diabetic patients.

Materials and Methods: A hospital-based prospective study was carried out from June 2018 to May 2019. A total of 100 patients of diabetes mellitus with urinary tract infection were included in this study.

Results: Of 100 patients, 54 were male and 46 were female, the most common age group was 46–55 years. Most patients had a fever with rigor (48%) followed by dysuria (22%), suprapubic pain (20%), increased frequency of urine (18%), flank pain (10%), pyuria (6%), and hematuria (4%). Urine culture analysis revealed that *Escherichia coli* (29%) was the most common organism responsible of urinary tract infection. The majority of isolated organisms were sensitive to antimicrobial agents such as amikacin, nitrofurantoin, and levofloxacin.

Conclusion: Urinary tract infection is frequent in diabetic patient and the urine culture should be performed in all hospitalized patients with diabetes mellitus. Early diagnosis, knowledge of common predisposing factors, and appropriate clinical management are important to improve prognosis.

Key words: Diabetes mellitus, *Escherichia coli*, Urinary tract infection

INTRODUCTION

Diabetes mellitus has become a major health challenge worldwide. In India, the prevalence of diabetes is expected to increase from 31.7 million in the year 2000–79.4 million in 2030.^[1] Diabetes mellitus has well-known risk factors such as age, heredity, obesity, hypertension, lack of exercise, smoking, alcoholism, dyslipidemia, and positive family history; few other possible risk factors are also under evaluation.^[2]

Diabetes mellitus has a number of long-term effects on the genitourinary tract system. Urinary tract infection

is one of the important causes of morbidity in diabetic patients.^[3]

The mechanism of pathogenesis for the association between diabetes mellitus and urinary tract infection is not completely clear. However, it is suspected that high glucose concentration in the urine of these patients may favor the growth of uropathogens.^[4] Human behavioral changes and lifestyle over the last century have resulted in a dramatic increase in the incidence of diabetes World Wide.^[5]

The impairment in the immune system, poor metabolic control, as well as incomplete bladder emptying due to the autonomic neuropathy may all contribute to the increased risk of urinary tract infection in diabetic patients.^[6]

Serious complications of urinary tract infection such as emphysematous cystitis, pyelonephritis, renal or perinephric

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www.ijss-sn.com

Month of Submission : 06-2020
Month of Peer Review : 06-2020
Month of Acceptance : 07-2020
Month of Publishing : 07-2020

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abscess, bacteremia, and renal papillary necrosis occur more commonly in diabetic patients.^[7]

Aim and Objective

The aim of the study is to assess the prevalence of urinary tract infections among hospitalized diabetic patients and identify the most frequent bacteria responsible for urinary tract infection.

MATERIALS AND METHODS

This prospective observational study was conducted at Indira Gandhi Institute of Medical Sciences, Patna, in the Department of General Medicine and the duration of the study was from June 2018 to May 2019. All one hundred cases in this study were examined according to clinical plan and investigated according to need. The study protocol was approved by the ethical committee of the institute and consent was obtained from each patient.

Inclusion Criteria

- The following criteria were included in the study:
- Type I and Type II diabetes mellitus patients with signs and symptoms of urinary tract infection
 - The patients more than 15 years of age
 - Patients who will give the consent for the study.

Table 1: Gender distribution of patients in diabetes mellitus with urinary tract infection

Sex	Number of patients	Percentage
Female	54	54
Male	46	46
Total	100	100

Table 2: Distribution of patients by age

Age group	Number of patients	Percentage
15–25	08	8
26–35	12	12
36–45	22	22
46–55	35	35
56–65	15	15
66–75	5	5
>76	3	3
Total	100	100

Table 3: Sign and symptoms of urinary tract infection in diabetes mellitus patients (n=100)

Sign and symptoms	Number of patients	Percentage
Fever with rigor	48	48
Dysuria	22	22
Suprapubic pain	20	20
Increased frequency of urine	18	18
Flank pain	10	10
Pyuria	6	6
Hematuria	4	4

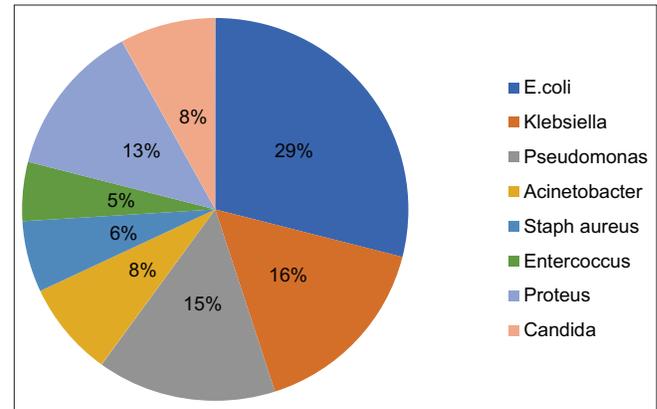
Exclusion Criteria

The following criteria were excluded from the study:

- The patients <15 years of age
- The patient who will not give consent for the study.

RESULTS

A total of 100 patients having diabetes mellitus with urinary tract infection were studied.



Pie chart showing uropathogens isolated in diabetes mellitus.

Most of the patients in the study were female (54%) as compared to male (46%) (Table 1). The most common age group was 46–55 years (Table 2). 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 hematuria (4%). Most of the patients were having more than one sign and symptoms (Table 3).

Escherichia coli (29%) was the most common organism isolated in urine culture followed by *Klebsiella* (16%), *Pseudomonas* (15%), *Proteus* (13%), *Acinetobacter* (8%), *Candida* (8%), *Staphylococcus aureus* (6%), and *Enterococcus faecalis* (5%).

E. coli isolated in this study had higher sensitive (86%) for amikacin and nitrofurantoin (23%) followed by colistin (20%), piperacillin plus tazobactam (18%), gentamicin (16%), levofloxacin (14%), ceftriaxone (9%), ciprofloxacin (4%), vancomycin (3%), and meropenem (2%). *Klebsiella* was more sensitive to levofloxacin (87.5%), nitrofurantoin (81%) and amikacin (75%), and least sensitive to ciprofloxacin (12.5%).

Pseudomonas aeruginosa was the third most common organism isolated in the urine of diabetic patients and they were sensitive to nitrofurantoin (86.6%), amikacin (66.6%), levofloxacin (40%), gentamicin (40%), piperacillin and

tazobactam (33.3%), colistin (26.6%), vancomycin (26.6%), ceftriaxone (20%), ciprofloxacin (13.3%), and meropenem (13.3%).

Acinetobacter was found to be sensitive most commonly with nitrofurantoin (75%) and amikacin (50%), whereas least sensitive to vancomycin (12.5%) and meropenem (12.5%). *S. aureus* was sensitive to amikacin (50%), nitrofurantoin (33.3%), ciprofloxacin (33.3%), ceftriaxone (33.3%), and gentamicin (33.3%) whereas levofloxacin, colistin, piperacillin plus tazobactam, vancomycin, and meropenem sensitive to *S. aureus* were 16.6%.

E. faecalis was sensitive to nitrofurantoin (60%), gentamicin (60%), amikacin (40%), piperacillin plus tazobactam (40%), ceftriaxone (40%), ciprofloxacin (40%), vancomycin (40%), meropenem (40%), levofloxacin (20%), and colistin (20%).

In this study, *Proteus* was commonly sensitive to nitrofurantoin (92.3%) and amikacin (84.6%) while least sensitive to meropenem (7.69%). In the 8% of the patient, *Candida* organism was isolated in urine culture and treated with antifungal.

DISCUSSION

In the present study, the prevalence of Urinary tract infection was slightly higher in female (54%) than male (46%). Females are vulnerable to UTIs due to their anatomy and reproductive physiology. The short urethra, urethra closer to the perirectal area where pathogen colonies easily, absence of bacteriostatic prostatic secretions, and sexual intercourse may force bacteria into the female bladder.^[8] Chaudhary et al. found 62.5% prevalence of UTI among females and 37.5% among males.^[9] Ijaz et al. showed more similar results to this study. They found 51.37% prevalence of UTI among females, while 48.63% in males.^[10] Most frequently, patients were in the affected age group from 46 to 55 years (35%). This was similar to a study by Simkhada.^[11]

In the present study, the most common clinical presentation was fever with rigor (48%) followed by dysuria (22%), suprapubic pain abdomen (20%), flank pain (10%), increase frequency of urine (18%), flank pain (10%), pyuria (6%), and hematuria (4%). A study done by Eshwarappa et al.^[7] demonstrated that fever and dysuria were the most common clinical presentation. In this study, *E. coli* (29%) was the most common organism isolated in urine culture followed by *Klebsiella* (16%) and *P. aeruginosa* (15%). *E. coli* is a normal inhabitant of the gastrointestinal tract and thus may be a potential source for the development of UTI.^[12] A study done by Ghadage et al.^[13] reported that *E. coli* (41.3%) was the predominant uropathogen isolated followed by *Klebsiella* spp. (18.5%) and *Enterococcus* spp. (12%).

E. coli, the most prevalent pathogen in the present study, was more sensitive to amikacin, nitrofurantoin, levofloxacin, colistin and piperacillin, and tazobactam whereas other antibiotics sensitive to *E. coli* were ceftriaxone, gentamicin, ciprofloxacin, vancomycin, and meropenem.

Amikacin, which is easily available and cost-effective, remains a good choice for most of the uropathogens if renal status allows and there is a facility to follow renal function test regularly. *Klebsiella* was most commonly sensitive to levofloxacin, nitrofurantoin, and amikacin whereas *Pseudomonas* was most commonly sensitive to nitrofurantoin, amikacin, and levofloxacin. In this study, the most common antibiotics sensitive to *Acinetobacter* were nitrofurantoin amikacin, levofloxacin, and ceftriaxone, whereas most common antibiotics sensitive to *S. aureus* was amikacin, nitrofurantoin, and gentamicin. *E. faecalis* was commonly sensitive to nitrofurantoin, whereas *Proteus* was sensitive to nitrofurantoin, amikacin, and colistin.

CONCLUSION

Urinary tract infections are frequent in patients with diabetes mellitus. The present study showed fever with rigor as the most common feature in patients with urinary tract infections having diabetes mellitus and the most common uropathogen was *E. coli*. The proper management of urinary tract infection in diabetes is crucial as prompt diagnosis and correct use of antibiotics is vital for treatment.

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How to cite this article: Choudhary MK, Kumar N, Prakash V, Mishra AK, Kumar A. Study of Urinary Tract Infection in Patient with Diabetes Mellitus. *Int J Sci Stud* 2020;8(4):45-48.

Source of Support: Nil, **Conflicts of Interest:** None declared.