

Frequency of Urinary Tract Infection in Diabetic Males

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ABSTRACT

Objective: To find out the frequency of urinary tract infection in diabetic males.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at the Lady Reading Hospital Peshawar Medical A ward from December 2020 to May 2021.

Materials and Methods: 150 patients were involved in study. These patients had type one and type two Diabetes mellitus and they did not take medicines for any illness. on microscopic examination of urine those patients who had >5 pus cells per high power field (phf) were selected and their mid stream urine (MSU) sample was then referred for culture and sensitivity. The culture results urine samples having colony forming units equal to 10^5 /ml of urine were considered as positive.

Results: 150 male diabetic patients comprising of (120 type 2 DM & 30 type1 DM) were included in study. Leukocyturia >5/hpf was found in 58/150 (38.66%) cases. In these 58 cases, cultures of urine whose results were positive was noted only in 36 (62.1%) patients. It was noted that frequency of urinary tract infection was 24% and the Ecoli was most common bacterium noted in 18 cultures of urine. In patients having type 2 diabetes mellitus, it was noted that Leukocyturia >5/hpf was present in 47/130 (43%) cases and in 29/47 (61.7%) patients culture of urine was noted positive. Patients, Leukocyturia >5/hpf was present in 11/30 (36.66%) and positive urine culture was found in 7/11 (63.64%) cases in type 1DM

Conclusion: It was found that in both Type 1 and type 2 diabetes mellitus urinary tract infection occurs commonly.

Key Words: Diabetes mellitus type 1, Diabetes mellitus type 2, urinary tract infection, culture and sensitivity, male.

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INTRODUCTION

There is increased risk for urinary tract infection in both type 1 and types 2 DM¹. In diabetic females Urinary Tract Infection (UTI) occur more commonly but males have increased risk of uti because of local and host risk factors. The main causative organism accounting for 85% of cases of UTI are enteric gram negative bacteria²⁻⁴. Less common bacteria are streptococci, enterobacteria, klebsiella, and staphylococcus saprophyticus⁵. The fungal infection is most frequently caused by candida. Viruses can also cause uti^{6,7}. Urine can be inhibitory or even bactericidal against minute inoculi of uropathogens in some situation⁸. In Diabetes mellitus change in chemical composition of urine can change the ability of urine and promote the growth of microorganisms.

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Experimental studies in animals showed that glycosuria can cause E coli infection⁹. In diabetes mellitus autonomic neuropathy impairs emptying of bladder causing UTI¹⁰. We conducted this study to find the frequency of urinary tract infection (UTI) in diabetic males.

In men Urinary tract infections are not very common because the length of the male urethra is long, less periurethral colonization in men and as the prostatic fluid is antibacterial. In males whose age is less than 50 years the incidence is 5 to 8 per 10,000 in an year. The lifetime prevalence of UTI is reckoned to be 13,000 to 14,000 per 100,000 male population and there is increase in frequency of urinary tract infection in males as the age increases¹¹. Although in women majority of urinary tract infections can be treated with antibiotics empirically without urine culture, but when men present with urinary tract infection a urine culture should always be obtained. UTIs in Diabetic patients are multifactorial in origin. There is increased risk for infection with greater severity or longer duration of the disease¹². The symptom which is most common for Urinary tract infections is dysuria in both women and men^{11,13,14}. Bacteria which are gram-negative live in colon also start colonizing the skin in periurethra are the main reason for UTI. The bacterium found mostly commonly in urinary tract infections in both males and females is E coli. Conditions such as Diabetes mellitus

and human immunodeficiency virus that suppress immune function also predispose men to recurrent urinary tract infection. The location of the infective process in the urinary tract may give a hint to the background etiology. For example pyelonephritis occurs due to obstruction in urinary tract due to a stone or a tumor. In contrary to this, lower urinary tract infections (e.g. urethritis, cystitis) occur due to infection due sexually transmitting diseases. The bacteria in the urinary tract infection give idea into the underlying predisposing condition e.g. *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* are mostly noted in individuals having anatomic obstruction¹⁵⁻¹⁷. In one of the study it was noticed that nearly 24% individuals having stone had urease-splitting bacteria¹⁸. Contrary to this *Neisseria gonorrhoeae*, *Ureaplasma urealyticum*, or *Trichomonas vaginalis* and *Chlamydia trachomatis* are sexually transmitted¹⁵⁻¹⁷. Infection with *Candida* (e.g. yeast) shows immunosuppression such as diabetes or corticosteroid use¹⁵⁻¹⁷. High number of resistant bacteria occur in patients with catheterization e.g. *Pseudomonas* species.¹⁹

In male patients UTI needs a urologic assessment as an underlying cause is expected to be established^{14,21}. In men symptoms like dysuria, frequency and urgency are having a positive predictive value of 75% for a urinary tract infection^{11,13}. Although flank pain is suggestive of pyelonephritis, pain in suprapubic suggests a diagnosis of cystitis. In Diabetic patients there is a high incidence of UTI than in non-diabetics leading to complications like dysuria, organ damage and can lead to death due to complicated UTI (e.g. pyelonephritis)²².

Evaluation include urinalysis alongside microscopy on a clean-catch, midstream urine sample. Positive Gram staining is 80% specific and 90% sensitive for an infection.¹ But a negative urine Gram staining report, especially on unspun urine, will not exclude a urinary tract infection. An uncentrifuged urine has a specificity and sensitivity 90% and 94%, respectively, when 100,000 colony-forming units (CFUs) per milliliter have been separated.²³ The gradation of pyuria has a sensitivity of 85% to 90% if more than 10 white blood cells per milliliter are existing on urine analysis. Dipstick testing has high specificity but very low sensitivity for the diagnosing infection. The standard gauge for diagnosing infection is a culture and sensitivity of urine. The precise count of bacteria needed for diagnosing a urinary tract infection in is debatable in men. Some advice treating any man with bacteriuria irrespective of the count, others give recommendation for treating for number higher than 10,000 CFUs. Men with history of recurrent urinary tract infection, suitable assessment via imaging, urologic testing, analysis for immune-deficiency states (for example diabetes, deficiency of immunoglobulin, HIV infection, lymphoma) ought to be followed.

Decision for treating an individual ought to be established on the culture and sensitivity. For infections which are uncomplicated, the first-line agents are trimethoprim-sulfamethoxazole and fluoroquinolones. The treatment duration is usually 7 to 10 days.^{12,14}

MATERIALS AND METHODS

This study was conducted on 150 male patients in Medical "A" Unit of lady Reading Hospital, Peshawar. Regarding duration of diabetes there were no specific criteria to find true frequency of UTI in men. Microscopic examination of urine was done in the hospital laboratory. In order to quantify the number of leucocytes in urine sample glass slide microscopy was used whereas the numbers of pus cells were counted per high power field (hpf) in resuspended sediment of centrifuged urine. Patients who had higher than 5/hpf leukocyte in urine were carefully chosen for culture of urine. The collection of mid-stream urine samples (M.S.U) was done in culture bottles and then referred to lrh laboratory. Those culture reports who were having colony forming units more than 10⁵/ml of voided urine were considered positive. The usual count of random blood sugar <200 mg was adopted as the standard for reasonable glycemia control.

Inclusion Criteria; Type 1 and type 2 Diabetes mellitus patients.

Exclusion Criteria; Numerous conditions that may prompt men to urinary tract infections for example blockade due to benign prostatic hyperplasia, stone formation, stricture due to trauma, tumor may cause stasis of urine with an increase in danger of infection were excluded. Instrumenting the urinary tract for a lot of aims (for example, assessment of voiding, catheterization and cystoscopy) is additional danger that can lead to UTI were excluded. Patients taking antibiotics were excluded.

RESULTS

Overall 150 patients were included in the study, in which 30 patients had Type 1 diabetes mellitus whereas 120 had Type 2 diabetes mellitus. Leucocyturia which was defined as more than 5/hpf occurred in 47 males (43%) having Type 2 diabetes mellitus and 11 males (36.6%) having Type 1 diabetes mellitus (Table I). Individuals having leucocyturia more than 5 per hpf were than choosed for culturing of urine. Forty seven patients having type 2 diabetes mellitus had leucocyturia more than 5 per hpf (Table 2). In these 47 patients, 29 (61.7%) had positive cultures for urine whereas 18(38.3%) cases were having no significant growth of any micro-organism. In a Similar way in 11 patients having Type 1 diabetes mellitus, 7(63.64%) had positive cultures for urine and 4 (36.36%) were having negative culture (Table II). Overall, 29/120 (24.16%) Type 2 diabetes mellitus patients, had UTI with positive cultures whereas 7/30(23.33 %) patients having Type 1

diabetes mellitus had UTI with positive cultures (Table 3). Overall 36(24%) patients had UTI, in which 29(80.55%) were having TYPE 2 diabetes mellitus and 7 (19.44%) had TYPE 1 Diabetes mellitus. The most common organism found from urine culture was *E. coli* (Table 4). *E. coli* was found in 18 (69.6%) cultures of urine. Enterobacteria in 3(11.11%), *Pseudomonas* in 2 (7.41%) and *Staphylococcus* in 3 (11.11%) positive cultures and *C. albicans* noted in 1 (3.7%) cultures which were positive.

Table No.1: Microscopic Examination Outcomes in Diabetic Males

Urine microscopy	Type 2DM (n=120)	Type 1DM (n=30)
Leukocyturia >5/hpf n=58	47(43%)	11(36.66%)
Leukocyturia <or=5/hpf n=92	73(60.83%)	19(63.33%)

Table No.2: Result of urine cultures in diabetic males having pus cells >5 / hpf

Result of urine cultures	Type 2 DM n=47/120	Type 1DM n=11/30
Culture results positive	29(61.7%)	7(63.64%)
Culture results negative	18(38.3%)	4(36.36%)
Total	47	11

Table No.3: UTI frequency in diabetic males

Urinary tract infection UTI	Type 2 DM n=120	Type 1 DM n=30
Patients with UTI	29(24.16%)	7(23.33%)
Patients without UTI	18 (15%)	4(13.33%)
Total	47	11

Table No.4: Types of microorganisms isolated

Organism isolated	Type 2 DM	Type 1DM	Total
<i>Pseudomonas</i>	2	0	2(7.41%)
<i>Staphylococcus</i>	2	1	3(11.11%)
<i>C. albicans</i>	0	1	1(3.7%)
<i>E. coli</i>	14	4	18(66.66%)
<i>Enterobacter</i>	3	0	3(11.11%)
Total	21	6	27

DISCUSSION

In our study which was done in 150 male diabetic patients, 120 had Type 2 diabetes mellitus while 30 patients had Type 1 Diabetes mellitus. Leucocyturia more than 5 pus cells/hpf was noted in 47/150(43%) of

the Type 2 Diabetic patients. Cultures of urine were positive in 24.16% (n=29/120) Type 2 diabetic patients and nil growth seen in 15% (N=18/120) of patients with Type 2 Diabetes mellitus. In 30 patients having Type 1 diabetes mellitus, leucocyturia more than 5 per high power field occurred in 36.66% (n=11/30) patients and cultures for urine were positive having significant bacteriuria in 23.33% (n=7/30) of patients. Our study can be matched with the Sewify M, et al²⁴ study including a total of 722 patients including both males and females. Which have shown frequency of leukocyturia as 35%. Patients having UTI were 7.5 times more expected to be having leukocyturia, whereas a leukocyte count <5cells/hpf has anticipated the nonexistence of urinary tract infection in 96% of the females²⁴. Similarly this study showed a relationship between leucocyturia >5 cells/high power field and positive culture results. In our study whole number of patients who had UTI were 24 (24%). So our study is comparable with the study of Patel JC²⁵ which was a prospective study of 14 years in 8793 hospitalized cases. He notified acute and chronic UTI in 31.4% of diabetic patients. These minute variations in results are because of a lot of factors. Our study was done on lesser number of patients; culture was not done on urine of all patients hence the precise number of UTI were not sensed. In a different study conducted by Brauner A et al host factors and virulence of bacteria was studied in 514 out-patients having DM and 405 controls who were non-diabetic. It was noted that the frequency of bacteriuria was not greater in women having diabetes (8/236, 3.4%). Whereas according to Brauner-A et al, the UTI frequency is almost equal in diabetic and non-diabetic women. In Brauner-A et al study, the standard for glycaemic control was HbA1C. In our study random blood sugar was used and it is not precisely dependable, but we did not perform HbA1C because of affordability. In EL-Kebbi IM et al²⁷ study it was noted that while blood glucose levels may not replace HbA1c findings, measuring fasting or random plasma glucose can be consumed to recognize improperly controlled type 2 DM patients with reasonable certainty in clinical environment. The most common bacteria found in our study was *Escherichia coli*. In 27 cultures which were positive, *E. coli* was isolated from 18 cultures with frequency of 66.66%. The additional bacteria isolated were *Staphylococcus aureus* with a frequency of 3(11.11%) Enterobacteriaceae 3(11.11%), *C. albicans* 1(3.7%) and *Pseudomonas* with frequencies of 2(7.41%). Our study is comparable with Ramrakhia S et al²⁶, which told frequency of 60% of *Escherichia coli* in cultures of urine in diabetic females. In Lye-WE et al²⁸ study, a total of 287 diabetic patients (66 males) having nosocomial and community acquired UTI were considered. The commonest organism was *E. coli* in community acquired urinary tract infection, but its incidence in diabetics was fewer as matched to non-

diabetic. Klebsiella species leading to community acquired urinary tract infection in diabetics was high as compared to non-diabetics. Our study showed that klebsiella was not found in culture of urine because our study group was trivial and culture of urine was done merely in 27 patients.

CONCLUSION

1. Urine culture should be advised and diabetic patients ought not to be started treatment for urinary tract infection merely on the base of Leucocyturia.
2. Urinary tract infection is commonly found in type 1 and type 2 diabetic patients.

Recommendations: Extensive studies are needed to study relation of glycemic control of diabetes mellitus with UTI.

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Author's Contribution:

Concept & Design of Study: Muhammad Abas Khan
 Drafting: Muhammad Abas Khan
 Data Analysis: Muhammad Abas Khan
 Revisiting Critically: Muhammad Abas Khan
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Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Muller LMA J, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AIM, et al. Increased Risk of Common Infections in Patients with Type 1 and Type 2 Diabetes Mellitus. *Clin Infect Dis* 2005;41(3):281-8.
2. Tolk-off-Rubin NE, Rubin RH. Urinary Tract Infection. In: Conran RS, editor. *Tubulointerstitial nephropathies contemporary issued in nephrology*. New York; Churchill Livingstone; 1983.p.49-82.
3. Crump J, Pead L, Maskell R. Urinary infections in general practice. *Lancet* 1976;1: 1882-5.
4. Gruneberg RN. Antibiotic sensitivities of urinary pathogens. *J Clin Pathol* 1980; 33: 853-6.
5. Pead L, Maskell R, Morris J. Staphylococcus saprophyticus as a urinary pathogen: A six year prospective survey. *Br Med J* 1985;219:1157-9.
6. Numazaki Y, Kumasaka T, Yano N, Yamanaka M, Miyazawa T, Takai S, et al. Further study of acute haemorrhagic cystitis due to adenovirus type II. *N Eng J Med* 1973;289: 344-7.
7. Davies JG, Taylor CM, White RHR, George. RH, Purdham DR. Cytomegalovirus infection associated with lower UTI symptoms. *Br Med J* 1979;1-1120.
8. Kaye D. Antibacterial activity of human urine. *J Clin Invest* 1968; 47: 2374.
9. Levison ME, Pitsakies PG. Effect of insulin therapy on the susceptibility of the diabetic rat to Escherichia coli induced pyelonephritis. *J Infect Dis* 1984;150:554-60.
10. Vejlsgaard R. Studies on urinary infection in diabetics. *Acta Med Scand* 1966;179:173-82.
11. Cunha B. Urinary tract infection, males. eMedicine. Updated October 19, 2009. <http://emedicine.medscape.com/article/231574-overview> Accessed March 10, 2011
12. Chen SL, Jackson SL, Boyko EJ. Diabetes mellitus and urinary tract infection: epidemiology, pathogenesis and proposed studies in animal models. *J Urol* 2009;182(6 Suppl):S51-6.
13. Griebing T. Urinary tract infection in men. In: Litwin MS, Saigal CS, editors. *Urologic Diseases in America*. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases Washington, DC: US Government Printing Office; NIH Publication No; 2007.p.623-645.
14. Hummers-Pradier E, Ohse AM, Koch M, et al. Urinary tract infection in men. *Int J Clin Pharmacol Ther* 2004;42(7):360-366.
15. Chamberlain NR. Bladder, kidney, and prostate. In: Chamberlain NR, editor. *The Big Picture: Medical Microbiology*, 1st ed. New York, NY: McGraw Hill; 2009.p.341-346.
16. Orenstein R, Wong ES. Urinary tract infections in adults. *Am Fam Physician* 1999;59(5):1225-1234, 1237.
17. Wilson ML, Gaido L. Laboratory diagnosis of urinary tract infections in adult patients. *Clin Infect Dis* 2004;38(8):1150-1158.
18. Qaader DS, Yousif SY, Mahdi LK. Prevalence and etiology of urinary stones in hospitalized patients in Baghdad. *East Mediterr Health J* 2006; 12(6):853-861.
19. Ko MC, Liu CK, Woung LW, et al. Species and antimicrobial resistance of uropathogens isolated from patients with urinary catheter. *Tohoku J Exp Med* 2008;214(4):311-319 [PubMed]
20. Monsen U, Sorstad J, Hellers G, et al. Extracolonic diagnoses in ulcerative colitis: an epidemiological study. *Am J Gastroenterol* 1990;85:711-716.
21. Lipsky BA. Urinary tract infections in men: epidemiology, pathophysiology, diagnosis, and treatment. *Ann Intern Med* 1989;110(2):138-150.
22. Saleem M, Daniel B. Prevalence of urinary tract infection among patients with diabetes in Bangalore city. *Int J Emerging Sci* 2011;1(2): 133-142.
23. Wiwanitkit V, Udomsantisuk N, Boonch alermvichian C. Diagnostic value and cost utility

- analysis for urine Gram stain and urine microscopic examination as screening tests for urinary tract infection. *Urol Res* 2005;33(3): 220-233.
24. Sewify M, Nair S, Warsame S, Murad M, Alhubail A. Prevalence of Urinary Tract Infection and Antimicrobial Susceptibility among Diabetic Patients with Controlled and Uncontrolled Glycemia in Kuwait. *J Diabetes Res* 2016;7.
 25. Petel JC. Complications in 8793 cases of diabetes mellitus 14 years study in Bombay Hospital, Bombay; India. *Ind Med Sci* 1989;43(7):177-83.
 26. Ramrakhia S, Raja K, Dev K, et al. (September 17, 2020) Comparison of Incidence of Urinary Tract Infection in Diabetic vs Non-Diabetic and Associated Pathogens. *Cureus* 2020;12(9).
 27. EL-Kebbi IM, Ziemer DC, Gallina DL, Phillips LS. Diabetes in Urban African-Americans. VI. Utility of Fasting or Random Glucose in Identifying Poor Glycemic Control. *Diabetes Care* 1998;21(4):501-5.
 28. Lye WC, Chan RK, Lee EJ, Kumarasinghe G. Urinary tract infections in patients with diabetes mellitus. *Infect* 1992; 24(2): 169-74.