

FREQUENCY OF URINARY TRACT INFECTION IN DIABETIC FEMALES

Nafisa Tahir¹, Qazi Tahir Uddin²

ABSTRACT

Objective: To determine the frequency of urinary tract infection (UTI) in diabetic females.

Material and Methods: This cross sectional study was conducted at Hayat Shaheed Teaching Hospital Peshawar from December 2001 to May 2002. Study included 100 female patients having type 1 or type 2 diabetes mellitus (DM), who were not taking antibiotics for any problem. Those patients who were having >5 pus cells per high power field (phf) on urine microscopy were selected and their mid stream urine sample (MSU) was sent for culture and sensitivity. Those culture reports were considered positive who had colony forming units of 10⁵/ml of urine. We adopted the conventional figures of random blood sugar <200 mg as the criteria for fair glycemic control.

Results: Out of 100 female diabetic patients (80 type 2 DM & 20 type1 DM) Leukocyturia >5/hpf was present in 33/100 (33%) cases. Out of these 33 cases, positive urine culture report was seen only in 23 (69.7%) cases. Overall frequency of UTI was 23% and the commonest organism isolated was *E. coli* in 16 urine cultures. In type 2 DM patients, Leukocyturia >5/hpf was present in 27/80 (33.75%) cases and positive urine culture was found in 19/27 (70.4%) cases. In type 1 DM patients, Leukocyturia >5/hpf was present in 6/20 (30%) and positive urine culture was found in 4/6 (66.7%) cases.

Conclusion: UTI is common in both Type 1 and type 2 diabetes mellitus. Well-designed studies are required to study association of UTI with glycemic control of DM.

Key words: Urinary Tract Infection, Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, Female.

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INTRODUCTION

Diabetes mellitus (DM) has a number of effects on genitourinary system. Patients with Type1 DM and Type 2 DM are at increased risk for urinary tract infection¹. Urinary Tract Infection (UTI) is more common in diabetic females because of a combination of host and local risk factors. The principal causative agents accounting for 85% of cases of UTI are enteric gram negative bacteria.²⁻⁴ Less frequently other organisms are involved such as klebsiella, enterobacteria, streptococci, staphylococcus saprophyticus particularly in young sexually active women.⁵ Other organisms that can produce UTI are pseudomonas and rarely mycoplasma. Anaerobic

UTI is a rare condition. The most frequent fungal infection is caused by candida. UTI can be caused by viruses.^{6,7}

Under some circumstances urine may be inhibitory or even bactericidal against small inoculi of uropathogens.⁸ Modification of chemical composition of urine in diabetes mellitus can alter the ability of urine and support the growth of microorganisms. In experimental animals osmotic diuresis secondary to glycosuria predispose to ascending *E coli* infection⁹. Autonomic neuropathy in diabetes mellitus impairs bladder emptying and subsequent urological manipulation predispose to UTI.¹⁰ This study was conducted to determine the frequency of urinary tract infection (UTI) in diabetic females.

MATERIAL AND METHODS

This study was conducted on one hundred female diabetic patients in Medical "B" Unit of Khyber Teaching Hospital, Peshawar. There were no particular criteria regarding duration of diabetes, in order to ascertain true frequency of urinary tract infection in diabetic women.

Urine microscopy was performed in the hospital laboratory. The method for quantitating the number of leucocytes in the urine was glass slide microscopy where numbers of pus cells per high power field (hpf) in resuspended sediment of centrifuged urine were counted.

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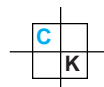
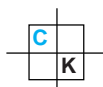
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Those patients having more than 5/hpf leukocyte in urine were selected for urine culture. Mid stream urine samples (M.S.U) were collected in culture bottles and sent to Pakistan Medical Research Centre, at Khyber Medical College Peshawar. Those culture reports were considered positive who had colony forming units more than 10⁵/ml of voided urine.

Although Van den Berghe et al¹¹ showed significant reduction of mortality by 34% in critically ill patients like cardiac surgery whose glucose levels were tightly controlled between 80 and 110 mg/dL, compared with patients whose levels were conventionally maintained under 200 mg/dL, the guidelines for non-hospitalized outdoor stable patients were not clear in the year 2001. So we adopted the conventional figures of random blood sugar <200 mg as the criteria for fair glycemic control.

RESULTS

Total number of patients in the study group was 100, out of which 80 patients were with Type 2 DM while 20 were with Type 1 DM. Leucocyturia more than 5/hpf was present in 27 patients (33.75%) with Type 2 DM and 6 patients (30.0%) with Type 1 DM (Table I).

Patients with leucocyturia more than 5 per hpf were selected for urine culture. Twentyseven patients with leucocyturia more than 5 per hpf were with Type 2 DM (Table II). Out of these 27 patients, 19 (70.4%) were with positive urine culture while in 8 (29.6%) cases, no significant growth of any micro-organism was obtained.

Similarly in 6 patients with Type 1 DM, 4 (66.7%) were with positive urine culture reports and 2 (33.3%) were with negative (Table II).

URINE MICROSCOPY RESULTS IN DIABETIC FEMALES

Urine Microscopy	Type 2 DM (n=80)	Type 1 DM (n=20)
Leucocyturia > 5/hpf (n=33)	27 (33.75%)	6(30%)
Leucocyturia < or = 5/hpf (n=67)	53(66.25%)	14(70%)

Table I

URINE CULTURE RESULTS IN DIABETIC FEMALES WITH PUS CELLS > 5/HPF

Urine Culture Results	Type 2 DM (n=27/80)	Type 1 DM (n=6/20)
Culture Result Positive	19(70.4%)	4(66.7%)
Culture Result Negative	8(29.6%)	2(33.3%)
Total	27	6

Table II

Overall, 19/80 (23.75%) Type 2 DM patients, were having urinary tract infection with positive urine culture reports while 4/20 (20 %) of Type 1 DM patients were having urinary tract infection with positive urine culture reports (Table III).

Total number of patients with UTI were 23 (23%), out of which 19 (82.6%) were with TYPE 2 DM and 4 (17.4%) were with TYPE 1 DM.

The commonest organism isolated from urine culture was E.coli (Table IV). E.coli was isolated from 16 (69.6%) urine cultures. Enterobacteriaceae from 3(13.04%) , Pseudomonas from 2 (8.7%) and Staphylococcus from 1 (4.35%) positive cultures and C.albicans was isolated in 1 (4.35%) positive culture.

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Urinary Tract Infection (UTI)	Type 2 DM (n=80)	Type 1 DM (n=20)
Patients with UTI	19(23.75%)	4(20%)
Patients without UTI	61(76.25%)	16(80%)
Total	27	6

Table III

TYPE OF MICRO-ORGANISMS ISOLATED

Organisms Isolated	Type 2 DM	Type 1 DM	Total
E.coli	13	3	16(69.56%)
Enterobacteriaceae	2	0	2(8.6%)
Pseudomonas	2	0	2(8.6%)
Staphylococcus	1	1	2(8.6%)
C.albicans	1	0	1(4.34%)
Total	19	4	23

Table IV

DISCUSSION

In this study which was conducted on one hundred female diabetic patients, eighty were Type 2 DM and twenty patients were Type 1 DM. Leucocyturia more than 5 pus cells/hpf was detected in 33.75% (n=27/80) of the Type 2 DM patients. Urine culture was positive in 23.75% (n=19/80) Type 2 DM patients and no growth was obtained in 10% (N=8/80) of Type 2 DM patients.

In 20 patients with Type 1 DM, leucocyturia more than 5 per high power field was detected in 30% (n=6/20) patients and urine culture was positive with signifi-

cant bacteriuria in 20% (n=4/20) of patients. Our study can be compared with the study of Lerman-Garber I et al¹² which shows that the overall prevalence of leukocyturia (>5 cells/high power field (hpf)) was 46.5%. Patients with urinary tract infections (UTI) were 7.5 times more likely to have leukocyturia, while a leukocyte count <5cells/hpf predicted the absence of UTI in 96% of the women.¹² This study also shows, that there is a relationship between leucocyturia >5 cells/high power field and positive urine culture reports.

In our study total number of patients having urinary tract infection were 23 (23%). This study is comparable with the study of Patel JC¹³ which was a 14 years prospective study, about the complications of urinary tract infection, done on 8793 hospitalized cases. He has reported acute and chronic urinary tract infection in 31.4% of patients with diabetes mellitus. The slight differences in results are due to many factors. Our study was conducted on small number of patients; urine of all patients was not sent for culture because of that, we were unable to detect the exact number of urinary tract infection.

In another interesting study by Brauner A et al¹⁴, bacteriuria, bacterial virulence and host factors were studied in 514 diabetic out-patients and 405 non-diabetic controls. It was found that the prevalence of bacteriuria was not significantly higher in diabetic women (8/236, 3.4%).

A good glycaemic control helps in reducing the prevalence of urinary tract infection. Where as according to Brauner-A et al¹⁴, the frequency of urinary tract infection in diabetic and non-diabetic females is almost equal. In Brauner-A et al¹⁴ study, HbA_{1c} was the criteria for glycaemic control, which is very reliable test for determining the glycaemic control over the previous three months period. We used random blood sugar which is not very reliable, but we were unable to perform HbA_{1c} because it was not freely available test in 2001 and majority of patients could not afford it. EL-Kebbi IM et al¹⁵ showed that although glucose levels cannot replace HbA_{1c} determinations, measurement of fasting or random plasma glucose may be used with reasonable certainty to identify poorly controlled type 2 patients in clinical set up.

In our study the commonest organism isolated was E.coli. Out of the 23 positive cultures, E.coli were isolated from 16 cultures, making the frequency 69.56%. The other organisms isolated were Enterobacteriaceae, pseudomonas, staphylococcus aureus and also c-albicans with frequencies of 2 (8.6%), 2 (8.6%), 2 (8.6%), 1 (4.34%) respectively.

Our study is comparable with Brauner-A et al¹⁴, study that has reported prevalence of E.coli 55% of urine culture in diabetic women.

In another study by Lye-WE¹⁶, a total of 287 diabetic patients (221 females) with community acquired

and nosocomial urinary tract infection were studied. There were 265 patients (228 females) without any predisposition to urinary tract infections and who served as controls. E.coli was the commonest organism in community acquired UTI, but its incidence was less in diabetic as compared to non-diabetic. The percentage of Klebsiella species causing community acquired UTI in diabetics was significantly higher than in non-diabetics. The antibiotic sensitivity pattern in the two groups, however, was not significantly different. In our study not a single klebsiella was isolated from the urine culture because the study group was very small and urine culture was conducted on 33 patients only.

CONCLUSIONS

1. UTI is common in both Type 1 and type 2 diabetes mellitus.
2. Diabetics should not be treated for UTI only on the basis of Leucocytouria and urine culture should be advised.
3. Well-designed studies are required to study association of UTI with glycemic control of DM.

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CONFLICT OF INTEREST
Authors declare no conflict of interest

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