PREVALENCE OF ASYMPTOMATIC SIGNIFICANT BACTERIURIA IN PATIENTS WITH DIABETES MELLITUS

Adnan Anoze *MRCP*, **Moayed A. Abode** *MBChB*

Abstract

Background: There are views that urinary tract infections are more common in diabetic patients but remain contentions because of varying study designs and end point.

Objective: This study was to assess the prevalence of significant bacteruria among diabetic patients with no urinary symptoms.

Subjects & Method: One hundred urine samples from diabetic patients (54 from patients with non insulin dependant diabetes mellitus (NIDDM), 46 from patients with insulin dependant diabetes mellitus (IDDM) and 80 urine samples from non diabetic control persons in an out patient clinic were screened for significant bacteriuria ($\geq 10^5$ colony forming unit/ ml).

Results: Nine percent (9%) of diabetic samples had significant bacteriuria (7=females and 2=males) while 2(2.5%) (both = females) of non diabetic samples had significant bacteriuria of those diabetics with significant bacteriuria 5(55.5%) were from NIDDM group and 4(44.5%) were from IDDM.

Conclusion: Analysis of the results showed significant high prevalence of significant asymptomatic bacteriuria in diabetic patients compared with non diabetic patients, (P value<0.05).

Key words: Asymptomatic Bacteruria, Diabetes Mellitus.

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Introduction

Diabetes mellitus and its attendant acute and chronic complications continue to carry a major health problem world wide[1]. There is evidence that diabetic are more prone to skin and chest infections than non diabetics[2]. There is also view that urine tract infections are more common, but remain contentions because of varying study designs and end point[3,4].

Under normal circumstances bacteria placed in the urinary bladder are rapidly cleared, partly through the flushing and dilutional effect of voiding, but also as a result of antibacterial properties of the urine and the bladder mucosa due to high urea concentration and high osmolarity. The bladder urine of many normal persons inhibits or kills bacteria; prostatic secretion poses antibacterial properties as well. Polymorphunuclear leucocytes in the bladder wall also appear to play a role in clearing bacteria. The role of locally produced antibody remains unclear[5].

Asymptomatic bacteriuria defined as $\geq 10^5$/ml organisms in the mid stream urine of person without urine symptoms (dysuria, frequency, haematuria, loin pain… etc.), there is no evidence that this condition causes chronic renal scarring in non-pregnant adults with normal urinary tracts. When it occurs in infants, pregnant women, immunocompromised and in abnormal urinary tract, investigations and treatment are required because of high risk of pyelonephritis in these settings[6,7].

Enumeration of the number and the type of bacteria in the urine is an extremely important diagnostic procedure. As a rule, quantitative estimation of the number of bacteria in voided urine specimens makes it possible to distinguish contamination from true bacteriuria and bacterial colony count of $\geq 10^5$/ml has been the criterion traditionally used for those purpose. However, in symptomatic women with pyuria, colony counts of 10^2-10^4 E-coli, proteus. Klabsiella or staph. Saprophyticus per milliliter of mid stream urine usually indicate infection, not contamination and should not be disregarded. In asymptomatic patients 10^5 or more bacteria of a single species/ml should be demonstrable in the specimen. In some circumstances (antibiotics, high urea concentration, high osmolarity, and low pH) inhibit bacterial multiplication, resu1ting in relatively low bacterial colony counts despite infection, for this reason; antiseptic solutions should not be used in washing the periurethral area before collection of urine specimen. Water diuresis or recent voiding also reduces bacterial count. Rapid methods of

Dept. Medicine, College of Medicine, Al-Nahrain University.
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Address Correspondence to Dr. Adnan Anoze

detection of bacteriuria have been developed as alternatives to standard culture methods. These methods detect bacterial growth by photometry, biolumiescence, or other means and provide results rapidly usually in 1-2 hours. These techniques generally exhibit a sensitivity of 95-98%, however, the sensitivity of these tests falls to 60-80% when 10^2-10^4 colony forming units/ml is the standard of comparison[8].

Microscopy of urine from symptomatic patients can be of great diagnostic value. Microscopical bacteriuria, which is best assessed with gram-stained uncentrifuged urine is found in more than 90% of specimens from patients whose infections are associated with colony counts of at least 10^5/ml, and this finding is very specific. However, bacteria cannot usually be detected microscopically in infections with lower colony count (10^2-10^4/ml). The detection of bacteria by urinary microscopy constitutes firm evidence of infection, but the absence of microscopically detected bacteria does not exclude the diagnosis[5,6,8].

When carefully sought by means of chamber-count microscopy, pyuria is highly sensitive indicator of urinary tract infections in symptomatic patients. Pyuria is demonstrated in nearly all acute urinary tract infections, and its absence calls the diagnosis in question. The leukocyte esterase "dipstick" method is less sensitive than microscopy in identifying pyuria but is useful alternative when microscopy not feasible[5,6,8].

Pyuria in the absence of bacteriuria "Sterile Pyuria" may indicate infection with unusual bacterial agents such as Chlamydia trachomatis, uroplasma urealyticum and mycobacteriurn tuberculosis or with fungi. Alternatively, sterile pyuria may be demonstrated in noninfectious urologic conditions such as calculi, anatomic abnormality, nephrocalcinosis, vesicoureteral reflux, interstitial nephritis or polycystic disease[5,6,8].

Aims of the study

1. Assessing the prevalence of significant bacteriuria among diabetic patients with no urinary symptoms.
2. To compare the results with non diabetic patients who also without urinary symptoms.

Patients & Methods

The study was carried out in diabetic clinic and medical outpatient clinic of Al-Kadhimiya Teachnig Hospital from March 2001 to September 2001.

Midstream urine samples were collected from 100 diabetic patients, age 15-71 years, attending the diabetic clinic, there were 53 females and 47 males. 54 were having NIDDM and 46 having IDDM. Also midstream urine samples were collected from 80 non diabetic patients attending the medical out patient clinic, there were 43 females and 37 males age 17-68 years.

The patients included in this study should have no symptoms of urinary tract infection; the females were not pregnant, not taking antimicrobial therapy within previous 2 weeks and not having functional or structural abnormalities of the urinary tracts.

General urine examination and cultures of each urine sample were done using the Standard Loop Technique. Urine cultures were done on nutrient agar medium and incubated for (24) hours for significant bacteriuria (colony count $\geq 10^5$/ml).

The antibiotic sensitivity patterns of identified isolates were determined using the standard disc diffusion method. The first requirement is fulfilled by taking good history from the patients asking about dysuria, polyuria, frequency, haematuria, loin pain, and frequency of sexual intercourse.

The second requirement is fulfilled by history taking ultrasound which has been done for all patients' diabetics and non diabetics included in this study. The third requirement has been achieved by good drug history which has been taken to be sure that the patient had not been on antibiotics for the last 2 weeks.

Results

Out of 100 diabetic urine samples examined, 9 (9%) had significant bacteriuria, while 2 out of 80 (2.5%) non diabetic urine samples had significant bacteriuria. The difference between the proportions of positive isolates was statistical1y significant ($p < 0.05$). In both groups, females more than males had significant bacteriuria (77.8% in diabetics and 100% in non diabetics).

Out of 9 positive isolates from diabetic urine samples, 5 (55.5%) were from NIDDM group and 4 (44.5%) were from IDDM group, this difference was statistically not significant. Three

different species of bacteria were isolated from the samples cultured in this study. Isolates include E.coli, Proteus, S.aureus. In both groups, E.coli was the most common isolates, 6 (66.7%) in diabetic samples while 2 (100%) in non diabetic samples.

Table 1: Number and percentage of samples with significant bacteriuria in diabetic and non-diabetic patients

Urine Culture	Diabetics	Non-diabetics
Positive	9 (9%)	2 (2.5%)
Negative	91 (91%)	78 (97.5%)

P = <0.05

Table 2: Distortion of isolates from urine samples of diabetic and non-diabetic patients

Organism	Diabetics	Non-diabetics
E.coli	6 (66.7%)	2 (100%)
Proteus	2 (22.2%)	-
Staph. aureus	1 (11.1%)	-
Total	9 (100%)	2 (100%)

Table 3: Antibiotic sensitivity of isolates from diabetic and non-diabetic patients

Organism	Gentamicin	Ampicillin	Nitrofurantoin	Nalidixic acid
E.coli	7=S(87.5%) 1=R(12.5%)	6=R(75%) 2=S(25%)	7=S(87.5%) 1=R(12.5%)	7=S(87.5%) 1=R(12.5%)
S.aureus	2= S(100%)	2=R(100%)	2=R(100%)	2=R(100%)
Proreus	S(100%)	R(100%)	S(100%)	S(100%)
Organism	**Cotrimaxzol**	**Cefotaxime**	**Tetracycline**	**Cephalothin**
E.coli	5=R(62.5%) 3=S(37.5%)	6=S(75%) 2=R(25%)	7=R(87.5%) 1=S(12.5%)	5=R(62.5%) 3=S(37.5%)
S.aureus	2= R(100%)	1=S(50%) 1=R(50%)	2=R(100%)	1=R(50%) 1=S(50%)
Proreus	S(100%)	S(100%)	R(100%)	R(100%)

There were no differences in sensitivity pattern of isolates from diabetic and non diabetic patients.

Table 4: Features of diabetic patients who had significant bacteriuria ($\geq 10^5$ organism/ml)

Sex	♀= 7(77.8%) ♂ = 2(22.2%)
Age	♀ = 4 > 50 years = 3 < 50 years ♂ = 2 > 50 years
Type of DM	IDDM = 4 (44.5%) NIDDM = 5 (55.5%)
o. of pus cells in GUE	All > 3 cells/hpf
Type of organism isolated	E.coli = 6(66.7%) Proteus = 2(22.2%) S. aureus = 1(11.1%)
Duration of DM	2 = 1-5 years 3 = 5-10 years 2 = 10-15 years 2 = > 15 years

Discussion

This study has revealed a higher prevalence of urinary tract infection among diabetic patients than non diabetic patients. Also it revealed that a higher prevalence of urinary tract infection in females in both group (diabetic and non diabetics).

E.coli is the most isolate in both groups which is sensitive to Gentamicin, Nitrofurantoin, Cefotaxime and Nalidixic acid. These results are in agreement with another studies had been done in Romania, Kenya, Canada and Nigeria[9-12]. While it is in disagreement with one study which had been done in Sweden in (1993), which shows that the prevalence of bacteriuria in diabetic out patients was not significantly higher than in non diabetic out patients, or healthy volunteers (P-value=0.07)[13]. The explanation of these results may be due to:

1. The presence of significant amount of glucose in diabetic urine, which serves as a favorable media for growth of bacteria[12].
2. A change in bacterial adhesion to the uroepithelium, partly as a result of abnormal intracellular calcium metabolism which lead to decrease in tamm horsfall protein which usually adhere to the bacteria and prevent attachment to the uroepithelium is involved in the pathogenesis of urinary tract infection in diabetic patients[14].
3. Also abnormal intracellular calcium metabolism lead to granulocytes dysfunction which leads to more attachment of bacteria to uroepithelium and more infection[14].

There are studies consistently document that the prevalence of asymptomatic bacteriuria is not influenced by type or duration of diabetic or by the quality of diabetic control[14] and this is in agreement with the results of this study.

The presence of pus cells in the GUE is sensitive for the presence of infection as in the patients in this study who had significant bacteriuria had>3 pus cell/ H.P.F. but presence of pus significant bacteriuria had >3 pus cell/H.P.F. but presence of pus cells less specific and it occurs in other conditions like nephrocalcinosis, interstitial nephritis, polycystic kidney disease, visico-ureteral reflux, anatomical abnormalities[6].

Conclusions & Recommendations

1. The prevalence of asymptomatic significant bacteriuria is higher among

patients with diabetic mellitus compared to non diabetic out patients.

2. It is not influenced by type or duration of diabetes.

3. It is more common in females than males.

4. Esherichia coli is the most common organism that causing asymptomatic bacteriuria in both diabetics and non diabetics.

5. All patients with diabetes mellitus should be screened for the presence of asymptomatic significant bacteriuria.

6. Patients with diabetes mellitus who have significant asymptomatic bacteriuria should be treated to prevent the complications of this condition such as chronic pyelonephritis, renal scarring and chronic renal failure.

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