Prevalence of Silent Bacteriuria in Patients with Diabetes Mellitus

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ABSTRACT:
BACKGROUND:
Diabetes mellitus and it's complications continue to carry a major health problem. There is evidence that diabetics are more prone to urinary tract infection.
AIM OF THE STUDY:
The study was done to assess the prevalence of significant bacteriuria in patients with no urinary symptom.
METHODS:
Midstream urine samples were collected from 200 diabetic patients. There were 102 females and 98 males and 80 urine samples from non diabetic persons as control were screened for bacteriuria.
RESULTS:
Out of 200 diabetic urine samples 18 patients [9%] had significant bacteriuria while 2 urine samples [2.5%] of non diabetic samples has significant bacteriuria. Three types of bacteria were isolated from urine samples,Escherchia coli, Staphylococcus, and Proteus and Escherchia coli was the high in number among the other genera.
CONCLUSION:
Analysis of the results showed significant bacteriuria in diabetic patients compared with non diabetic patients {p value < 0.05}.
KEY WORDS: bacteriuria , diabetes mellitus

INTRODUCTION:

Diabetes Mellitus is a common metabolic disorder and result in several abnormalities of the host defense system that might increase the risk of certain infections. Infection in diabetic patients is the most serious complication which continues to be a big health problem all over the world .Diabetic foot ulcer were the major cause of infection followed by pulmonary tuberculosis, Urinary tract infection, pneumonia and skin and subcutaneous infections [1,2]. There is a view that urinary tract infection is more common in diabetic patients [3] but remain in debate because of varying study designs [4].

According to the 1998 WHO criteria, diabetes mellitus was defines as fasting glucose concentration of at least 6.1 mmol/l (110 mg/dl) or a two-hours postprandial glucose concentration of at least 10.0 mmol/l (180 gm/dl) or use of glucose lowering medication (tablets or insulin) [5].

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The presence of pyuria and bacteriuria are two most important indicators of urinary tract infections [6]. Many urinary tract infections are asymptomatic .In contrast with men; the prevalence of asymptomatic bacteriuria is three to four times higher among women with diabetes and tends to have persistent or recurrent bacteriuria than those without this condition [7,8,9].

The bladder urine of normal persons inhibits and kills bacteria .Polymorph nuclear leukocytes in the bladder wall also appear to play a role in killing bacteria.

Asymptomatic bacteriuria was defined as the presence of at least 10^5 colony forming units (cfu) /ml of the same single species plus pyuria in one culture of clean voided specimen of midstream urine sample from an individual without symptoms of UTI [8,9].we defined contaminated urine as the presence of at least 3 different microorganisms in one urine sample, these specimen were excluded

A symptomatic bacteriuria also defined as $\geq 10^5$ / ml

of one single species in the midstream urine of person without urinary symptoms {frequency, dysuria, haematuria, loin pain……etc.},when it occurs in infants, pregnant women, immunocompromized persons and in abnormal urinary tract investigations and treatment is required because of high risk of pyelonephritis in those patients. The recognition of the number and type of bacteria in the urine is very important diagnostic procedure.Quatitative estimation of the number of bacteria in urine specimens make it possible to distinguish contamination from true bacteriuria and bacterial colony count of $\geq 10^5$/ml has been the criterion traditionally used for this purpose .However in symptomatic women with pyuria , colony counts of 10^2-10^4 Escherichia coli,Proteus ,Klebsiella or Staphylococcus saprophyticus per milliliters of midstream urine usually indicate infection, not contamination and should not be disregarded . In certain circumstances (antibiotics, high urea concentration, high osmolarity ,low PH) inhibit bacteria multiplication resulting in relatively low bacteria colony counts despite infection, for this reason antiseptic solution should not be used in washing the periurethral area before collection of urine specimen.

Rapid screening methods for detection of bacteriuria have been developed as alternative to standard culture methods, these methods have been developed for measuring bacterial concentration such as a new automated flow cytometry-based urine bacterium analyzer [10,11] in addition to other rapid screening methods such as Yellow IRIS [12] that provide results rapidly usually in 1-2 hours .These techniques exhibit sensitivity of 95%-98% .The sensitivity of these tests fall to 60%-80% when 10^2 -10^4 colony forming units per ml is the standard of comparison.

Microscopy of urine from symptomatic patients can be of great diagnostic value. Microscopical bacteriuria, which is best assessed with Gram's stained and centrifuged urine is found in more than 90% of specimens from patients whose infections are associated with colony counts of at least 10^5 per ml and this finding is very specific. Bacteria can not 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.

Leukocyte esterase dipstick method is less sensitive than microscopy in identifying pyuria [13,14] but is useful alternative when microscopy is not feasible.

PATIENTS AND METHODS:

Participants

The study was conducted in diabetic clinic in AlKadhmyia hospital from June 2007 to November 2007 .Midstream urine samples were collected from 200 diabetic patients and screened for asymptomatic bacteriuria, age 16-70 years attending the diabetic clinic, there were 102 females and 98 males, 122 having non insulin dependent diabetes mellitus (NIDDM) and 78 patients having insulin dependent diabetes mellitus (IDDM).

Midstream urine samples were collected from 80 non diabetic patients attending the medical outpatient clinic; they were 50 females and 30 males.

The criteria for inclusion in the study are:-

1-no urinary tract symptoms.

2-no antibiotic administration within previous two weeks

3-no pregnancy for females

4-no functional or structural abnormalities of the urinary tract.

Full history taking, good physical examination, ultrasonography and blood sugar reading have been done to fulfill the inclusion criteria.

Urine analysis

All urine samples were either transport to the microbiology laboratory for culture within 2 hours of collection or refrigerated. urine culture was performed according to standard procedure(8): urine was screened for the presence of either more than 5 leukocytes or 10 microorganisms were seen in the slide then the urine was plated onto blood agar and MacConkey plates ,all urine samples were plated using quantitative loop and the plates were incubated at 37C° aerobically, the results were read after 24 hours .Microorganisms were identified with API system (Analytic Profile Index system) [bioMerieux].if the urine was considered contaminated the patient was asked to submit another sample.

RESULTS:

Out of 200 diabetic urine samples examined 18 [9%] had significant bacteruria, while 2 urine samples out of 80 [2.5%] non diabetic urine samples had significant bacteruria.

In both groups [the diabetic and the control group], females are more than males in having significant

bacteriuria [77.8% in diabetics and 100% in non diabetics].

Out of 18 positive isolates from diabetic urine samples 10 [55.5%] were from NIDDM group and 8 [44.5%] were from IDDM group, this deference was statistically not significant.

The results of microbial culture on blood agar and MacConkey agar and API system showed the prevalence of the isolates of Escherchia coli ,Proteus and Staphylococcus aureus in both group, Escherchia coli was the most common isolates 12 [66.7%] in diabetic samples while in control group (non diabetic) was 2 [100%] samples.

Table 1: Samples of significant bacteriuria in diabetic and non diabetic patients P. value < 0.05 (statistically significant)

Urine culture	Diabetic samples	Non diabetic samples
Positive	18 [9%]	2 [2.5%]
Negative	182 [91%]	78 [97.5%]

Table 2: Distribution of bacterial isolates from urine samples of diabetic and non diabetic patients.

Organism	Diabetic samples	Non diabetic samples
E.coli	12 [66.7%]	2 [100%]
Proteus	4 [2.2%]	non
Staph. aureus	2 [11.1%]	non
total	18	2

Table 3: features of diabetic patients who had significant bacteriuria {≥ 10^5 organism/ml}

Sex	Females = 14[77.8%] Males = 4 [22.2%]
Age	Females = 8>50 years 6< 50 years Males = 4 > 50 years
Type of Diabetic	IDDM =8 [44.5%] NIDDM = 10 [55.5%]
Number of pus cells	All more than 5 cell /H.P.F.
Types of organisms isolated	Escherchia coli = 12 [66.7%] , Proteus = 4 [22.2%] Staphylococcus aureus = 2 [11.1%]
Duration of Diabetes	4 = 2-5 years 6 = 5-10 years 4 = 10-15 years 4 = > 15 years

DISCUSSION:

In the majority of urinary tract infections bacteria gain access to the bladder and then to the renal pelvises via the urethra. Hematological spread of infection may be blamed but in rare cases .Renal parynchaymal infections may be a result of this descend.

This study has revealed a higher prevalence of asymptomatic bacteriuria among diabetic patients than non diabetic patients, this is comparable with the study by Nicolle in 2005 [15] also other studies [9,16,17], although some investigators demonstrated no significant difference in the prevalence of asymptomatic bacteriuria between diabetic and non diabetic women [p value=0.02] [18,19].

It also revealed that a higher prevalence of asymptomatic bacteriuria in females in both groups [diabetic and non diabetics], which confirms the results of a study by Nicolle et al in 2006 [20]. As most other previous studies [21,22], Escherchia coli was the most prevalence organism in both groups, in few studies ,the microorganism was different for example Klebsiella was the most common organism [23,24] .

The factors that predispose to periurethral colonization with Gram negative bacilli remain poorly understood but probably include alteration of normal perineal flora.

The higher prevalence of bacteriuria among females could be due to:-
- Presence of short urethra in females.
- The female urethra appears to be particularly prone to colonization with colonic gram-negative bacilli because of its proximity to the anus.
- Sexual intercourse causes the introduction of bacteria to the bladder.
- Absence of prostatic secretion which contain bactericidal properties.

The explanation of the above results may be due to:
- The presence of significant amount of glucose in diabetic urine, which serves as a favorite media for growth of bacteria [19,25].
- a change in bacteria adhesion to the uroepitherium ,partly as a result of abnormal intracellular calcium metabolism which lead to decrease in Tam-horsfall protein which usually adhere to the bacteria and prevent attachment to uroepithelium is involved in the pathogeneses in the urinary tract infection in diabetic patient [26].

- Abnormal intracellular calcium metabolism lead to granulocytes dysfunction which leads to more attachment of bacteria to uroepithelium and more infection [26].
- Escherichia coli with type 1 fimbriae adheres better to uroeithelial cells in women with diabetes mellitus than to those without Diabetes [27].

There are studies consistently documents that the prevalence of asymptomatic bacteriuria is not influenced by type or duration of diabetic or by the quality of diabetic control and this is in agreement with the results of this study[26].

The presence of pus cells in the GUE is sensitive for the presence of infection as in patients in this study who had significant bacteriuria(> 3 pus cell / H.P.F.) but presence of pus cells is less specific and it occurs in other conditions like nephrocalcinosis, interstitial nephritis, polycystic kidney disease and anatomical abnormalities [28].

CONCLUSION:

The prevalence of asymptomatic significant bacteriuria is higher among patients with diabetic compared to non diabetic patients and it is more common in females than males.

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

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