

A Study of Asymptomatic Bacteriuria in North Indian Type 2 Diabetic Patients

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Abstract

Introduction: The significance of asymptomatic bacteriuria is largely unknown. The prevalence of asymptomatic bacteriuria in diabetic patients varies from 9-27% in various studies which is certainly higher as compared to healthy individuals. The various risk factors which lead to increased prevalence of asymptomatic bacteriuria in diabetic patients are immune system dysregulation, development of bladder dysfunction and prostatism.

Methodology: Patient having type 2 diabetes mellitus along with age and sex matched controls that were hemodynamically stable were enrolled. A prospective cross sectional and comparative study was done. A total of 200 patients were enrolled and they were divided into two groups i.e. those with diabetes and non-diabetic patients (age and sex matched controls) without symptoms of UTI. Urine examination and biochemical investigations of the patients were done. Comparisons were made in both groups using appropriate statistical tests.

Results and conclusions: In our study the prevalence of asymptomatic bacteriuria among the diabetic patients was significantly higher 28.2% as compared to 7.5% in the controls ($p=0.001$). The mean HbA1c levels were significantly higher in the patients with asymptomatic bacteriuria ($p<0.001$). There were no significant differences in the s. creatinine levels in the patients with asymptomatic bacteriuria. The main risk factors for asymptomatic bacteriuria in our study were female sex ($p=0.003$), increased age ($p=0.007$), longer duration of diabetes mellitus ($p=0.003$), poor Glycemic control ($p<0.001$) and recent urinary tract infection ($p=0.02$). The risk factors for asymptomatic bacteriuria seem to be similar in our study as in the previous studies. The presence of asymptomatic bacteriuria may be considered a marker of poorly controlled and long standing diabetes.

Keywords: Asymptomatic bacteriuria; HbA1c; Creatinine; Glycemic control; Urine culture

Introduction

Urinary tract infection is an important clinical problem for people with diabetes. This observation is most apparent in the increased severity of this infection that may occur in diabetic patients [1]. Serious complications of urinary infection, such as emphysematous cystitis, pyelonephritis, or renal and perinephric abscess, occur virtually only in diabetic patients. On a population basis, diabetic women, depending on age, are 6-24 times more likely than non-diabetic women to be admitted for acute pyelonephritis, and diabetic men are 3.4-17 times more likely than their non-diabetic counterparts to be admitted for the same condition [2]. Knowledge of risk factors for UTIs in diabetic patients is important to identify patients in need of therapy to prevent serious complications. Also of importance is the fact that many diabetic patients are infected with non-*Escherichia coli* species, in particular *Klebsiella*, other gram-negative rods, enterococci, and group B streptococci [3].

Bacteriuria is a condition in which bacteria remain and multiply in urine, which is the second most common problem in developing countries, after the respiratory tract infection. Generally, infection of urinary tract shows clinical symptoms like burning sensation during micturation, increased frequency of micturation, dysuria, increased frequency of micturation, urgency, lower abdominal / pelvic pain, pyuria, purulent discharge per urethra, fever, and strangury [3]. However, in some patients the clinical symptoms may remain unnoticed, to the patient themselves despite presence of significant bacteriuria. Such symptomless infection of urinary tract is called covert or asymptomatic bacteriuria. Asymptomatic bacteriuria is one of the common problems seen in diabetic patients preceding symptomatic UTI [4].

The significance of asymptomatic bacteriuria is largely unknown. The prevalence of asymptomatic bacteriuria in diabetic patients varies from 9-27% in various studies which is certainly higher as compared to healthy individuals [4]. The various risk factors which lead to increased prevalence of asymptomatic bacteriuria in diabetic patients are immune system dysregulation, development of bladder dysfunction and prostatism. Many studies have reported that asymptomatic bacteriuria has a higher prevalence in diabetic individuals as compared to non-diabetics [5-9]. The risk factors for the development of diabetes have been longer duration of diabetes [5,6,8], recent urinary tract infection [6,8] uncontrolled blood sugar levels [5,10], lower BMI [6] and macroalbuminuria [6,8]. Studies have also reported that diabetic patients with asymptomatic bacteriuria tend to have more symptomatic urinary tract infections than those without it [7]. A meta-analysis by Renko et al. has also reported that on a long term follow up the diabetic individuals with asymptomatic bacteriuria had significantly lower GFR than those without it [7].

The recurrent use of broad spectrum antibiotics is associated with

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increased prevalence of asymptomatic bacteriuria and some studies [5,10] indicate that presence of asymptomatic bacteriuria adversely affects Glycemic control in these patients and may lead to complications like symptomatic urinary tract infection and deranged renal functions. The unnecessary treatment of patients with antibiotics may also lead to burden of antibiotic resistance. The current Infectious Disease Society of American guidelines do not recommend the regular screening and treatment of diabetic patients with asymptomatic bacteriuria [11].

Through this study we have made an effort to study the prevalence of asymptomatic bacteriuria in North Indian patients with type 2 Diabetes Mellitus, its effect on glycemic control in patients with diabetes mellitus and a study of clinical profile of the patients.

Methodology

Study was conducted in Department of Medicine, King George's Medical University, Lucknow. Patient having type 2 diabetes mellitus, attending diabetic OPD, and those admitted in indoor medical wards who were hemodynamically stable were enrolled. A prospective cross sectional and comparative study was done. The patients with anatomical anomalies of the urinary tract, urolithiasis, neurological bladder dysfunction, symptoms of urinary tract infection [10] and advanced organ dysfunction were excluded from the study.

The sample size was calculated by using the following formula [7]

$$n = \frac{4pq}{d^2}$$

where n=sample size required,

p=prevalence (6%) [6], q=1-p

d= desired precision

Assuming 80% power and 5% significance level with 95% confidence interval, the total sample size (n) calculated was 90.

A total of 200 patients were enrolled and they were divided into two groups i.e. those with diabetes and non-diabetic patients (age and sex matched controls) without symptoms of UTI. There were 8 drop outs in the diabetic group and 7 dropouts were in the control group thus there were total 92 diabetic patients and 93 controls.

The participants were also inquired about the duration of diabetes, history of urinary tract infection, history of treatment for urinary tract infection (<1 year), treatment history & other clinical data. Anthropometric data including height, weight and waist circumference was also collected from each patient.

Each patient was instructed to collect a clean-catch midstream urine specimen after cleaning genital region prior to micturation. In men glans penis was asked, to be cleaned with swabs soaked in clean tap water, then asked to pass about 50 ml of urine into a toilet or bowl but next portion (midstream) 5-10 ml was collected into a clean sterile bottle. In women before collection of urine labia were separated by patient or nurse and vulva cleaned twice in an anteroposterior direction with swabs soaked in clean tap water and then with a dry swab, whilst the labia held still apart, urine collected in a similar way as men. Antiseptic solutions were not used for cleaning as it may interfere with growth of bacteria during culture.

About 20mL urine specimen was collected in a sterile screw-capped wide-mouth container from each patient. The urine sample was sent immediately to the department of Microbiology, KGMU for routine, microscopy and culture.

Blood samples were taken from patients and biochemical investigations were done in the lab in the Department of Biochemistry and Pathology, King George's Medical University, Lucknow.

All the below mentioned routine investigations were performed:

- Haemogram
- Urine Routine & Microscopy
- Urine culture and sensitivity by using Cysteine Lactose Electrolyte Deficient media.

The diagnosis of asymptomatic bacteriuria is: [12]

For asymptomatic women, bacteriuria is defined as 2 consecutive voided urine specimens with isolation of the same bacterial strain in quantitative counts of greater than or equal to 10^5 cfu/mL.

For asymptomatic men a single, clean-catch, voided urine specimen with 1 bacterial species isolated in a quantitative count of greater than or equal to 10^5 cfu/mL.

In our study we performed one urine examination and culture with colony counts $>10^5$ were labeled as bacteriuria in both men and women.

- Serum Urea, Serum Creatinine
- Fasting blood sugar/ Post Prandial blood sugar by Dry biochemistry with Vitros – 250 Johnson & Johnson Autoanalyser
- Glycosylated Hemoglobin (HbA1c) by High-performance liquid chromatography method
- Ultrasonogram of the Genito-Urinary Tract

Comparisons were made in both groups using appropriate statistical tests. The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 16.0 statistical Analysis Software. The values were represented in Number (%) and Mean \pm SD.

Results

Both the groups were sex and age matched

Prevalence of asymptomatic bacteriuria in Group A was 28.2% as compared to 7.5% in Group B, thus showing a significant difference between two groups ($p < 0.001$). The prevalence of females with asymptomatic bacteriuria in Group A was significantly higher (39.1%) as compared to females in Group B (10.8%) ($p < 0.001$). The prevalence of males with asymptomatic bacteriuria in Group A was significantly higher (17.3%) as compared to females in Group B (4.2%) ($p = 0.008$).

The patients in Group A were divided into two groups based on the presence of asymptomatic bacteriuria i.e. ASB(+) and ASB(-).

Mean age of patients in ASB(+) was significantly higher as compared to ASB(-) ($p = 0.007$). The mean HbA1C levels were significantly higher in ASB(+) as compared to mean HbA1c levels of ASB(-) ($p < 0.001$). Mean duration of diabetes was significantly longer in ASB(+) as compared to ASB(-) ($p = 0.003$). There was no significant difference in the mean serum creatinine levels in ASB(+) as compared to that in ASB(-) ($p = 0.68$).

The percentage prevalence of patients in group A ASB(+) with HbA1c levels >7 (poor glycemic control) is 92.3% is significantly higher than the percentage prevalence in ASB(-) HbA1c levels >7 (poor glycemic control) is 54.5% ($p = 0.001$).

The patients in Group A with asymptomatic bacteriuria had

higher prevalence of symptomatic urinary tract infections (46.1%) as compared to culture negative patients (19.6%).

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