

Asymptomatic Bacteriuria in Patients with Diabetes Mellitus

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ABSTRACT

Background: Asymptomatic bacteriuria is a common problem in diabetic patients and is associated with risk of septicemia and pyelonephritis if untreated. The diagnosis is based on urine culture. The incidence of antibiotic resistance has been steadily increasing over the past few years resulting in limitation of therapeutic options.

Aims & Objectives: This study was carried out to determine the prevalence of asymptomatic bacteriuria in diabetic patients and also to isolate, identify and establish the antimicrobial susceptibility pattern of the pathogens.

Materials & Methods: This prospective study includes 1000 diabetic patients. Isolates were identified by conventional methods and their antibiotic susceptibility pattern was established.

Statistical Analysis: The results were analyzed using mean, median and Chi-square (χ^2) test.

Results: A total of 120 (12%) were positive for significant bacteriuria. *Escherichia coli* was the most predominant organism followed by *Klebsiella pneumoniae*. Imipenem, piperacillin-tazobactam, nitrofurantoin and amikacin were found to be the most effective antibiotics against the urinary isolates.

Conclusion: The prevalence of asymptomatic bacteriuria is high in diabetic patients and poor glucose control can be considered as a predisposing factor. Routine urine culture is recommended, especially for the detection of asymptomatic bacteriuria cases in diabetic patients.

Key Words: Asymptomatic bacteriuria, *Escherichia coli*, *Klebsiella pneumoniae*, Urinary tract infection, Diabetes mellitus

INTRODUCTION

Diabetes mellitus has a number of long term effects on the genitourinary system. This effect predisposes to bacterial Urinary Tract Infection (UTI) [1]. Risk factors such as age, duration, glycemic control, and complications of diabetes are associated with UTI [2, 3].

It is also a predisposing factor for significant asymptomatic bacteriuria (ASB). Un-treated asymptomatic bacteriuria predisposes the individual to recurrent UTI which can cause renal disease (pyelonephritis and gram negative septicemia) [1,4,5]. UTI is one of the most important cause of morbidity in diabetic patients.

ASB is microbial diagnosis based on isolation of specified quantitative count of bacteria in urine from diabetic patients without signs or symptoms of UTI. *Escherichia coli* were found to be most prevalent in ASB. The misuse of antibiotics is a major factor responsible for bacterial resistance [1, 6].

MATERIALS AND METHODS

This study on asymptomatic bacteriuria in diabetes was carried out in the Department of Microbiology, Sree Siddhartha

Medical College and Hospital, Tumkur. A total of 1000 diabetic patients attending various out-patient departments and admitted in wards were taken for the study.

Asymptomatic bacteriuria is defined as the “presence of actively multiplying bacteria within the urinary tract excluding the distal urethra”, at the time when the patient has no urinary symptoms [7].

Exclusion Criteria:

1. History of UTI symptoms (dysuria, frequency and urgency, etc).
2. History of antibiotic therapy in the previous two weeks.
3. Pyrexia.
4. Known congenital anomalies of the urinary tract.

Urine samples were collected by standard mid-stream “clean catch” method from all the diabetic patients, in a sterile, wide-mouthed container that can be covered with a tightly fitted lid. Microscopic examination of a wet film of uncentrifuged urine was carried out to detect the presence of pus cells, erythrocytes, microorganisms, casts etc. The samples were processed using standard microbiological procedures. The specimens were cultured on to dried plates of MacConkey’s agar,

Sheep Blood agar with 5-10% CO₂ atmosphere and Cystine Lactose Electrolyte Deficient agar, by standard loop method and incubated at 37°C overnight. Culture results were interpreted as being significant and insignificant, according to the standard criteria. The organisms were identified by routine methods from the samples showing significant bacteriuria [8,9].

The standardized Kirby-Bauer disc diffusion test of the Clinical and Laboratory Standards Institute (formerly NCCLS) was used for antibiotic susceptibility testing and accordingly interpretations were carried out. The antibiotics tested were: imipenem, piperacillin-tazobactam, amikacin, gentamicin, nitrofurantoin, ceftazidime, cefotaxime, norfloxacin, ciprofloxacin, amoxicillin-clavulanic acid, ampicillin, tetracycline, co-trimoxazole and erythromycin [10].

The results were analyzed using mean, median and Chi-square (χ^2) test. p (predictive) value of < 0.05 was considered as a significant association between the variables tested.

RESULTS

The study shows highest number of culture positive cases among diabetic women (70) when compared to diabetic men (50). People in the age group of 55 yrs and above (24.1%) were affected more when compared to others [Table/Fig-1].

Of the total 1000 samples processed, significant growth was found in 120 (12%) samples, while 880 (88%) samples showed no growth. The commonest isolated organism being *Escherichia coli* 50 (41.7%), followed by *Klebsiella pneumoniae* 25 (20.9%), *Staphylococcus aureus* 15 (12.5%), *Pseudomonas aeruginosa* 10 (8.3%), *Proteus mirabilis* 06 (5%), *Citrobacter koseri* 05 (4.1%), *Enterococcus faecalis* 04 (3.3%), *Staphylococcus saprophyticus* 03 (2.5%) and *Streptococcus pyogenes* 02 (1.7%).

In our study the organisms were sensitive to imipenem (100%), piperacillin-tazobactam (100%), nitrofurantoin (90%), amikacin (85%), ceftazidime (76%), cefotaxime (76%), gentamicin (72%), norfloxacin (70%), ciprofloxacin (68%), amoxicillin-clavulanic acid (68%), tetracycline (34%), erythromycin (30%), co-trimoxazole (22%) and ampicillin (18%) [Table/Fig 2].

| Age Group in years | Males (%) | Females (%) | Total (%) | |
|--------------------|------------|-------------|------------|-----------------|
| 30-34 | 6 (5 %) | 8 (6.7%) | 14 (11.7%) | p=0.6392 |
| 35-39 | 7 (5.8%) | 9 (7.6%) | 16 (13.4%) | |
| 40-44 | 7 (5.9%) | 13 (10.8%) | 20 (16.7%) | p>0.05 |
| 45-49 | 9 (7.5%) | 14 (11.6%) | 23 (19.1%) | |
| 50-54 | 8 (6.7%) | 10 (8.3%) | 18 (15%) | Not Significant |
| 55-59 | 13 (10.8%) | 16 (13.3%) | 29 (24.1%) | |
| Total | 50 (41.7%) | 70 (58.3%) | 120 (100%) | |

[Table/Fig-1]: Age & sex wise distribution of diabetics with asymptomatic bacteriuria

| Name of the Antibiotic | Antibiotic sensitivity pattern (%) |
|-----------------------------|------------------------------------|
| Imipenem | 100 |
| Piperacillin-tazobactam | 100 |
| Nitrofurantoin | 90 |
| Amikacin | 85 |
| Ceftazidime | 76 |
| Cefotaxime | 76 |
| Gentamicin | 72 |
| Norfloxacin | 70 |
| Ciprofloxacin | 68 |
| Amoxicillin-clavulanic acid | 68 |
| Tetracycline | 34 |
| Erythromycin | 30 |
| Co-trimoxazole | 22 |
| Ampicillin | 18 |

[Table/Fig-2]: Antibiotic sensitivity pattern of bacterial Isolates

DISCUSSION

Urinary Tract Infection affects as many as 50% women at least once during their lifetime. In the present study, it was observed that the diabetic females (58.3 %) were affected more as compared to diabetic males (41.7 %) [11].

In our study significant growth was found in 12% cases and 88% samples were sterile. These results were consistent with reports of the recent studies [12, 13]. The presence of significant bacteriuria indicates the significance of microbiological culture to clinch the diagnosis of urinary tract infection.

Bacterial isolates have been changing from time to time and from place to place. In our study organisms isolated, correlated with various others studies [3, 4]. In a recent study, it was noted that increased adherence of *Escherichia coli* with type 1 fimbriae to uroepithelial cells isolated from the urine of women with diabetes correlated positively with HbA1C. Poorly controlled patients had a higher adherence of *Escherichia coli*. Changes in host defence mechanisms, the presence of diabetic cystopathy and of microvascular disease in the kidneys may play a role in the higher incidence of UTI in diabetic patients. However the other factors like shortness of female urethra, urethral opening near the anus and vagina, biologic changes due to menopause in females and prostate enlargement and neurogenic bladder in men contribute to asymptomatic bacteriuria [6]. The microorganisms causing asymptomatic bacteriuria in persons with diabetes mellitus are similar to those causing bacteriuria in non-diabetic individuals [3, 14, 15].

The antimicrobial sensitivity and resistance pattern varies from

community to community and from hospital to hospital. This is because of emergence of resistant strains as a result of indiscriminate use of antibiotics. In our study isolates showed 100% sensitivity to imipenem and piperacillin-tazobactam. Ampicillin was found to be least sensitive (18%). Our antibiogram pattern correlates with others studies [3, 4].

Diabetes enhances the progression from asymptomatic to symptomatic bacteriuria, which could lead to septicemia, pyelonephritis and adverse complication which require specialized treatment strategies. So routine urine culture is recommended, especially for the detection of asymptomatic bacteriuria cases in diabetic patients.

CONCLUSION

Asymptomatic bacteriuria is more prevalent among diabetic population than in the non-diabetics, a major public health problem which has to be addressed at the earliest to forestall future complications. So routine urine culture is recommended, especially for the detection of asymptomatic bacteriuria cases in diabetic patients.

Asymptomatic bacteriuria can be ascertained on the basis of microscopy and microbial culture. Gram negative organisms were the commonest organisms isolated. In view of the emerging drug resistance amongst bacteria, antibiotic therapy should be advised only after culture and sensitivity has been performed. This would not only help in the proper treatment of the patients but also discourages the indiscriminate use of the antibiotics which prevent further development of bacterial drug resistance.

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