

# Asymptomatic Bacteriuria in Elderly Patients with Diabetes Attending a Tertiary Care Center

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## Abstract

**Introduction:** A symptomatic bacteriuria (ASB) is the presence of at least 105 colony-forming units (CFU) per ml of 1 or 2 bacterial species in clean-voided midstream urine sample from an individual without symptoms of urinary tract infection (UTI). The objective of this study was to determine the prevalence of asymptomatic bacteriuria in diabetic patients and also to establish the antimicrobial susceptibility pattern of the pathogens.

**Methodology:** Urine sample was collected from above 30 years old diabetic patients who attended Diabetes Endocrinology and Thyroid Care Center, Lalitpur for regular blood sugar estimation between the periods of August 2012 to April 2013. Culture and Antibiotic susceptibility test were performed using standard microbiological technique.

**Results:** A total 18.4% out of 467 diabetic patients had ASB. *Escherichia coli* (47.7%) were the most predominant organism followed by *Klebsiella pneumoniae*. Imipenem (100%), nitrofurantoin (96%) and amikacin (87%) were found to be the most sensitive antibiotics against the urinary isolates.

**Conclusion:** The prevalence of ASB is high in diabetic patients and poor glucose control can be considered a predisposing factor. Routine urine culture can be recommended for diabetic patients even when there is no urinary symptom.

**Keywords:** Antimicrobial resistance; Asymptomatic bacteriuria; Diabetics; UTI

## Introduction

Asymptomatic bacteriuria is a form of UTI characterized by the presence of significant amount (>105 cfu/ml) of bacteria in urine [1]. The urinary tract is usually sterile. The risk of infection is higher and ASB is serious clinical problem in patients with diabetes mellitus [2]. Diabetes mellitus (DM) has long been considered to be a predisposing factor for ASB. However, since the concept of significant bacteriuria was introduced the reported data on the prevalence of asymptomatic bacteriuria appear to be conflicting [3]. There is 60% increase in the risk of UTI and a two- to four-fold increase in genital tract infections [4]. In addition, diabetic subjects, especially women, show high prevalence of ASB. In diabetic women, various risk factors for ASB have been suggested including age, presence of macroalbuminuria, low body mass index (BMI) and UTIs during the previous year [5].

The main risk factors for ASB in DM are: inadequate glycemic control, duration of DM, diabetic microangiopathy, impaired leukocyte function, recurrent vaginitis, and anatomical and functional abnormalities of the urinary tract [6]. The mechanism of pathogenesis for this association between DM and ASB is not completely clear. However, it is suspected that high glucose concentration in the urine of these patients may favour the growth of uropathogens [7].

Asymptomatic bacteriuria is common in neonates, preschool children, pregnant women, elderly people, diabetics, catheterized patients and patients with abnormal urinary tracts or renal disease [7]. Though there is currently no consensus on treatment of asymptomatic bacteriuria in various population groups, it is advisable to treat asymptomatic bacteriuria in DM, as these patients may progress to symptomatic UTI or develop complications of UTI. This study was done to determine the prevalence of asymptomatic bacteriuria among diabetic patients, causative pathogens and their antimicrobial pattern. The results of this study would help in formulating plans and strategies

for the control of the infection.

## Materials and Method

This is a hospital-based descriptive study. The study included out-patients attending to Diabetics Endocrinology and Thyroid Care Center, Lalitpur from August 2012 to April 2013, and was commenced after obtaining the necessary permission from the institution ethics committee. The patients suspected with ASB and over the age of 30 years were taken for the study. Exclusion criteria used for ASB were history of UTI symptoms (dysuria, frequency and urgency, etc.) and history of antibiotic therapy in the previous two weeks. Patients who were taken for this study had both the controlled and uncontrolled DM. The criterion used for defining asymptomatic bacteriuria was the presence of at least 105 CFU/ml in culture of clean-voided mid-stream urine specimen or obtained by urethral catheterisation.

Regarding the patients with ASB, urine samples were obtained by clean voided mid-stream technique. Quantitative urine culture was performed using a dip-slide method; urine was also streaked on MacConkey agar and Blood agar. After incubation at 37°C for 24-48 hrs, the microorganisms were identified by standard biochemical tests. In vitro susceptibility to antibiotics was performed by an agar diffusion method (Kirby Bauer) employing dried filter paper discs impregnated with specific concentration of antimicrobial agents in according to the National Committee for the Clinical Laboratory Standards [8].

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Received May 01, 2015; Accepted June 02, 2015; Published June 09, 2015

**Citation:** Rijal M, Neupane B, Bhandari P, Aryal S (2015) Asymptomatic Bacteriuria in Elderly Patients with Diabetes Attending a Tertiary Care Center. J Trop Dis 3: 162. doi:10.4172/2329891X.1000162

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All the suspected patients were interviewed on the basis of a specific questionnaire in order to know their age, gender, presence or absence of symptoms of UTI. The criteria used to exclude possible diabetic patients from non-diabetic group was to make sure that they had a negative diabetic history and absence of glycosuria and fasting blood sugar less than 126 mg/dl.

The statistical analysis of the results was carried-out using Chi-square (X<sup>2</sup>) test. P (predictive) value of < 0.05 was considered as a significant association between the variables tested.

## Results

Of the total 467 (253 females and 214 males) samples processed; significant growth was found in 86 (18.42%) samples while 381 (81.58%) samples showed no growth. The results show highest number of culture positive cases among diabetic women (52) when compared to diabetic men (34). People in the age group of 40-49 yrs (29.1%) were affected more when compared to others (Table 1). The commonest isolated organism being *Escherichia coli* (41, 47.7%) and least were *Streptococcus pyogenes* (2, 2.3%) (Table 2). In our study the organisms were more sensitive to imipenem (100%) and very low sensitivity towards co-trimoxazole (19%) (Table 3).

## Discussion

The association of DM and UTI is increasingly being reported. ASB is common among diabetic patients and may lead to serious

Age (in years)	Number (%)			p value > 0.05
30-39	7 (8.1)	4 (4.7)	11 (12.8)	
40-49	15 (17.5)	10 (11.6)	25 (29.1)	
50-59	14 (16.3)	8 (9.3)	22 (25.6)	
60-69	9 (10.5)	7 (8.1)	16 (18.6)	
70 and above	7 (8.1)	5 (5.8)	12 (13.9)	
Total	52 (60.5)	34 (39.5)	86 (100)	

Table 1: Age and sex wise distribution of diabetics with ASB.

Isolated Bacteria	Number of isolates (%)
<i>Escherichia coli</i>	41 (47.7)
<i>Klebsiella pneumoniae</i>	16 (18.6)
<i>Staphylococcus aureus</i>	11 (12.8)
<i>Proteus mirabilis</i>	8 (9.3)
<i>Enterococcus faecalis</i>	5 (5.8)
<i>Staphylococcus saprophyticus</i>	2 (2.3)
<i>Streptococcus pyogenes</i>	2 (2.3)
<i>Staphylococcus epidermidis</i>	1 (1.2)
Total	86 (100)

Table 2: Bacterial isolates from diabetics with ASB.

Antibiotics (Concentration)	Sensitivity pattern (%)
Imipenem	100
Nitrofurantoin	94
Amikacin	87
Cefotaxime	75
Gentamycin	68
Chloramphenicol	65
Ciprofloxacin	63
Cotrimoxazole	19
Ampicillin	16

Table 3: Antibiotic sensitivity pattern of bacterial isolates.

complications if not properly managed [9]. ASB is more prevalent in women [10]. Reports on the prevalence and aetiology of ASB appear contradictory especially in developing countries.

This study showed the association between DM and ASB. This result is comparatively higher with the study done in Teaching Hospital Bharatpur [11] in 2009 (9.43%). But prevalence of ASB in diabetic patients was reported 42% [7] in 2013 and 26.6% [12] in 2003. This might be due to the geographic and time variation of isolates. The variations in percentages of ASB have been attributed to factors such as geographical variations, ethnicity of the subjects and variation in the screening test [13].

Even though age is a well-known risk factor for bacteriuria in patients without diabetes and some studies have shown age as the most important risk factor for ASB in type 2 diabetic patients [14], but in our study age had no significant relation with ASB (p = 0.5794). As most other previous studies, *E. coli* was the most prevalent microorganism (59.1%) isolated from urine cultures of our participants. However, a few previous studies have shown different microorganisms as the commonest cause of UTI, as *Staphylococcus* [9] and *Kelebsiella* [12]. *E. coli* being the most frequent etiological agent in UTI is due to its toxins and adhesions, pili or fimbriae that allow adherence to uroepithelial cells and prevent bacteria from urinary lavage, allowing for multiplication and tissue invasion, which play an essential and critical role in the infectious process because they mediate the initial mucosal colonization of the host. These adhesins enable the bacterium to recognize specific cell surface receptors in the uroepithelium of the host [15,16].

In this study, imipenem was the most sensitive drug followed by nitrofurantoin and amikacin, while cefotaxime, gentamycin, chloramphenicol and ciprofloxacin were moderately sensitive to the isolates. Most isolated microorganisms were resistant to cotrimoxazole and ampicillin. It seems that use of these drugs to treat bacteriuria in diabetic patients should be with caution and patients should be followed-up regularly.

## Conclusion

The study showed a high prevalence of ASB among diabetes mellitus patients. So routine urine culture is recommended, especially for the detection of asymptomatic bacteriuria cases in diabetic patients to forestall future complications of this major public health problem. Gram negative organisms were the commonest organisms isolated specially *E. coli*. Imipenem was the most effective antibiotic against bacterial isolates. 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.

## Acknowledgements

We thank all the doctors, nurses, staffs and technicians of Diabetics Endocrinology and Thyroid Care Center for their kind support during the study. We would also like to express our sincere gratitude and respect to all the patients who were the most important part of the study. This paper was extracted from the results of the study conducted by students. We are thankful for Diabetics Endocrinology and Thyroid Care Center for providing financial help for the study.

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