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Bacteriological profile of asymptomatic bacteriuria among diabetic patients

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Abstract

Introduction: Prevalence ofasymptomatic bacteriuria (ASB) among diabetic patients is high compared to patients without diabetes. The present study was aimed at determining the prevalence asymptomatic bacteriuria with diabetes and antimicrobial susceptibility pattern of isolated uropathogens.

Materials and Methods: A prospective observational study was conducted in a rural tertiary care teaching hospital, in the department of microbiology to study the prevalence of ASB among patients with diabetes mellitus. Clean catch method was used to collect urine samples. All the urine specimens were processed according to standard microbiological procedures.

Results: A total of 150 diabetic patients (81 females and 69 males) were included in the study. 25 urine specimens yielded significant bacterial growth and accounted for 16% Asymtomatic bacteriuria (ASB).Urine specimens collected from female 17 (11.3%) diabetic patients yielded growth predominatly. Urine samples collected from both male and female patients between the age group 51-60 (36%) years and 61-70 (24%) predominatly yielded the growth. In control group, Out of 150 urine samples from non diabetic patients, 7 urine specimens yielded growth and accounted for 4-6% asymptomatic bacteriuria. Escherichia coli was the predominant bacteria isolated in both study group and control group which accounted for 44% and 100% respectively.

Conclusion: Asymptomatic bacteriuria among diabetic patients found to be high (16%) compared to healthy control group (4.6%). E,coli was the predominantly isolated bacteria from both diabetic patients and healthy control group. All Gram negative bacteria showed 100% susceptibility to imipenam. Good susceptibility was observed against both Gram positive and Gram negative bacteria by amikacin (90-100%) and nitrofurantoin (71-100%).

Keywords: Asymptomatic bacteriuria, Diabetes, Escherichia coli, Amikacin, Nitrofurantoin.

Introduction

Diabetes is considered as one of the largest emerging threats to health in the 21st century and it is estimated that there will be 380 million persons with diabetes in 2025.(1) Urinary tract infection is an important clinical problem for people with diabetes.(2) UTI in patients with diabetes mellitus occurs because of high level of glucose in urine which serves as culture media for multiplication of bacteria defects in neutrophil function and increases adherence to uroepithelial cells.(3) Serious complications of urinary infection, such as emphysematous cystitis, pyelonephritis, or renal and perinephric abscess, occur virtually only in diabetic patients.(4)

The term asymptomatic bacteriuria (ASB) is used when a bacterial count of the same species over $\geq 10^5$ CFU/ ml in midstream clean catch specimen of urine is obtained during no symptoms of urinary tract infection. The prevalence of ABU in the population varies widely with age, gender, Body Mass Index (BMI), disease status including Diabetes Mellitus (DM), previous history of UTI, sexual activity, presence of genitourinary abnormalities, previous genitourinary instrumentation, intervention or surgery, and albuminuria.(5) Several studies have documented the association of ASB with diabetes, however, reportson the prevalence of ASB appear contradictory. The prevalence of asymptomatic bacteriuria in diabetic patients varies from greatly in various studies which is certainly higher as compared to healthy individuals.(6)

The present study was aimed at determining the prevalence asymptomatic bacteriuria with diabetes and antimicrobial susceptibility pattern of isolated uropathogens.

Materials and Methods

A prospective observational study was conducted in a rural tertiary care teaching hospital, in the department of microbiology to study the prevalence of ASB among patients with diabetes mellitus. One hundred and fifty randomly selected patients (30-80 years) diagnosed with diabetes mellitus and presenting to hospital with various ailments other than urinary tract infections were included in the present study. One hundred and fifty non-diabetic healthy individuals from general population were enrolled in the study as control group. Criteria for inclusion were age > 18 years, history of diabetes. Exclusion criteria included pregnancy, history of any underlying illness such as urogenital abnormalities, signs and symptoms of UTI and those who took antibiotics in past seven days. Clean catch mid stream urine sample collection method was explained to all the participants. Collected urine samples were subjected to standard microbiological procedures. The samples were inoculated for semi- quantitative culture on bacteriological culture media. Specimen inoculated plates were kept in

incubator at 37° C for overnight. If the colony count was $\geq 10^5$ considered as significant bacteriuria and if the colony count is below 10^5 considered as insignificant growth. Further Gram's staining and biochemical reactions were performed. More than one type of colonies on culture plate was considered as contamination and repeat sample was requested. Disc diffusion method was used to perform antimicrobial susceptibility as per CLSI guidelines.[7] Antibiogram was performed by using seven commonly used antibiotics in UTI except imipenam which is reserved drug.

Results

A total of 150 diabetic patients (81 females and 69 males) were included in the study. All patients in the study group had diabetes mellitus-Type 2. Out of 150 urine samples from diabetic patients, 25 urine specimens yielded significant bacterial growth and accounted for 16% Asymtomatic bacteriuria (ASB).

Table 1: Age and sex wise distribution of asymptomatic bacteriuria

Age in years	Male	Female
30-40	-	1
41-50	2	3
51-60	3	6
61-70	2	4
71-80	1	3
Total	8(5.3%)	17(11.3%)

Urine specimens collected from female 17 (11.3%) diabetic patients yielded growth predominatly. Only 8 (5.3%) urine specimens collected from male patients yielded growth. Urine samples collected from both male and female patients between the age group 51-60 (36% years and 61-70(24%) predominatly yielded the growth.

In control group, Out of 150 urine samples from non diabetic patients, 7 urine specimens yielded growth and accounted for 4.6% asymptomatic bacteriuria. Specimens with significant bacteriuria all were from females and their age was above 50 years. No bacterial growth was found in urine specimens collected from males. Escherichia coli was the only bacteria isolated in control group.

Table 2: Distribution of isolated uropathogens

Bacteria	Number (%)
Escherichia coli.	11 (44%)
Klebsiella species	7 (28%)
Staphylococcus saprohyticus	4 (16%)
Enterococci	3 (12%)

Escherichia coli was the predominant bacteria isolated in both study group and control group which accounted for 44% and 100% respectively. Klebsiella species (28%) was the second most pathogen isolated. Gram positive cocci, Stahylococcus saprophyticus and Enterococci were isolated and accounted for 16% and 12% respectively.

Table 3: Antibiotic susceptibility pattern of uropathogens

Bacteria	Amx	Nit	Ctr	Cot	Cip	Ak	Imp
Escherichia coli[11]	2(18%)	9(81%)	5(45%)	7(63%)	7(63%)	10(90%)	11(100%)
Klebsiella species[7]	2(28%)	5(71%)	2(28%)	4(57%)	4(57%)	7(100%)	7(100%)
Staphylococcus saprohyticus[4]	3(75%)	3(75%)	3(75%)	2(50%)	2(50%)	4(100%)	NT
Enterococci[3]	3(100%)	3(100%)	1(33%)	1(33%)	2(66%)	3(100%)	NT

Amx-Amoxycillin,Nit-Nitrofurantoin, Ctr-Ceftriaxone, Cot-Cotrimoxazole, Cip-Ciprofloxacin, Ak-Amikacin, Imp-Imipenam, NT-Not tested

Discussion

In this study, we found that the rate of ASB among type 2 diabetes was 16% and 7% in non-diabetic patients. This is similar to the study conducted by Bonadio et al[8] and Meiland et al[9] in which they observed the rate of asymptomatic bcteriuria among diabetic patients was 17.5% and 17% respectively. Few studies reported more prevalence of asymptomatic bacteriuria among diabetic patients compared to the present study. As per Ophori et al, 36% ASB was found and according to the study conducted by Greelings et al, 26% ASB among diabetic patients.[10,11] However, few researchers found low rate of asymptomatic bacteriuria among diabetic persons.[12,13] In the present study, the female diabetics were found to have a higher prevalence of asymptomatic bacteriuria than males. Female sex has been deemed as an independent risk factor for asymptomatic bacteriuria, regardless of the presence of DM, by these studies.

Escherichia coli was the most common organism isolated.This is similar to the studies conducted by previous researchers.[14] However, report from previous study noted a changing pattern of ASB with Klebsiella sp accounting for the majority (42.4%) of asymptomatic bacteriuria among diabetics.[15] Another study by Omoregie et al, in Nigeria reported Staphylococcus sp

to be the most common uropathogen isolated from both diabetics and non-diabetics with ASB. The high prevalence of Staphylococussp in ASB may bedue to the fact that these organisms are mostly perineal skin flora and can be introduced into theurethra during sexual intercourse.[16] In our study, no Candida species was isolated. However, higher carriage rate of Candida sp has also been reported in diabetics and this was attributed to the presence of excess glucose in diabetics that may encourage the growth of Candida sp.[17]

Treating diabetic patients with asymptomatic bacteriuria remains controversial. As per current guidelines, antibiotic therapy of asymptomatic bacteriuria is definitely indicated only in pregnancy, renal transplant and before an invasive genitourinary procedure.[18] Majority of researchers from US recommend treating ASB in diabetic patients because of the frequency and severity of upper UTIs.[19] There is a scarcity of studies regarding the management of ASB in diabetic individuals to prevent the occurrence of complications and the dilemma of treatment versus not treating patients with ASB persists. Long-term follow-up studies are required to show whether ASB becomes symptomatic and affects renal function in diabetic patients and whether treatment of ASB is warranted.

Conclusion

Asymptomatic bacteriuria among diabetic patients found to be high (16%) compared to healthy control group (4.6%). E,coli was the predominantly isolated bacteria from both diabetic patients and healthy control group. All Gram negative bacteria showed 100% susceptibility to imipenam. Good susceptibility was observed against both Gram positive and Gram negative bacteria by amikacin (90-100%) and nitrofurantoin (71-100%).

References

1. Atkins RC, Zimmet P. Diabetic kidney disease: Act now or pay later. Saudi J Kidney Dis Transpl. 2010;21:217–21.
2. Joshi N, Caputo GM, Weitekamp MR, Karckmen AW: Infections in patients with diabetes mellitus. N Engl J Med .1999;341:1906–12.
3. Maharjan MN, Mandal KP, Sharma KV. Comparative Study among the Bacterial Causes of Urinary Tract Infection in Diabetic and Non-Diabetic Patients Visiting Alka Hospital, Lalitpur. Ann Clin Med Microbio .2015;1(2):1006.
4. Singhal S, Himanshu D, Vaish AK, Singh M, Rana H, et al. (2015) A Study of Asymptomatic Bacteriuria in North Indian Type 2 Diabetic Patients. J Diabetes Metab 6:620. doi:10.4172/2155-6156.1000620
5. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. Clin Infect Dis. 2005;40:643-54.
6. Nicolle LE (2003) Asymptomatic bacteriuria: when to screen and when to treat. Infect Dis Clin North Am 17: 367-394.
7. Forbes BA, Sahm DF, Weissfeld AS. Chapter 13, Overview of bacterial identification methods and strategies. Bailey and Scott's diagnostic Microbiology, 12th ed. St.Louis: Mosby;2007. p. 216-47.
8. Bonadio M, Boldrini E, Forotti G, Matteucci E, Vigna A, Mori S et al. Asyptomatic Bacteriuria in women with Diabetes: Influence of Metabolic Control. Clin Infect Dis. 2004;38:e41-5.
9. Meiland R, Geerlings SE, Stolk RP, Netten PM, Schneeberger PM, Hoepelman AI. Asymptomatic bacteriuria in women with diabetes mellitus: effect on renal function after 6 years of follow-up. Arch Intern Med. 2006;166:2222-7.
10. Ophori EA, Imade P, Johnny EJ. Asymptomatic bacteriuria in patients with type-2 diabetes mellitus. Journal of Bacteriology Research. 2010;2:14-7.
11. Geerlings SE, Stolk RP, Camps MJ, Netten PM, Collet JT, Schneeberger PM et al. Consequences of asymptomatic bacteriuria in women with diabetes mellitus. Arch Intern Med. 2001;161:1421-7.
12. Karunajeewa H, McGechie D, Stuccio G, Stingemore N, Davis WA, Davis TME. Asymptomatic bacteriuria as a predictor of subsequent hospitalisation with urinary tract infection in diabetic adults: The Fremantle Diabetes Study. Diabetologia. 2005;48:1288-91.
13. ShashidharVishwanath, Radhika Sarda, Annet Olinda D'souza, Chiranjay Mukhopadhyay. Asymptomatic Bacteriuria among Patients with Diabetes Mellitus at a Tertiary Care Center. National Journal of Laboratory Medicine. 2013;2(3):16-19.
14. Vranes J, Marijan T, Bedenic B, Mlinaric-Dzepina A, Katic S and Kalenic S. Clonal dissemination of highly virulent extended-spectrum ß-lactamase-producing Escherichia coli strains isolated from the urine of non-hospitalised patients in Zagreb region. Int J Antimicrob Agents. 2008;31:19-24.
15. Alebiosu CO, Osinupebi OA, Olajubu FA. Significant asymptomatic bacteriuria among Nigerian type 2 diabetics. J Natl Med Assoc 2003;95:344-351.
16. Omoregie R, Erebor JO, Ahonkhai I, Isibor JO, Ogofere H. Observed changes in the prevalence of uropathogens in Benin City, Nigeria. Nz J Med Lab Science 2008;29-31.
17. Al-Attas SA, Amro SO. Candidal colonization, strain diversity and antifungal susceptibility among adult diabetic patients. Annals of Saudi Medicine 2010;30(2):101–108.
18. Jicolle le, Bradley s, Colgan r, rice jc, schaeffer a, hooton tm. infectious diseases society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. clin infect dis. 2005;40(5):643-54.
19. Patterson 1b, Andriole VT. Bacterial urinary tract infections in diabetes. Infect Dis Clin North Am 1997;11:735-50.