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Asymptomatic bacteriuria among hospitalized diabetic patients: Should they be treated?

Manuel J Ramos-Ramirez, Salim Surani

ORCID number: Manuel J Ramos-Ramirez (0000-0001-6693-8016); Salim Surani (0000-0001-7105-4266).

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Manuel J Ramos-Ramirez, Corpus Christi Medical Center, Corpus Christi, TX 78412, United States

Salim Surani, Medical Critical Care Services, Christus Spohn Hospitals-Corpus Christi, Corpus Christi, TX 78413, United States

Corresponding author: Salim Surani, BSc, FACC, FACP, FCCP, MD, Professor, Medical Critical Care Services, Christus Spohn Hospitals-Corpus Christi, 701 Ayers Street, Corpus Christi, TX 78404, United States. srsurani@hotmail.com

Telephone: +1-36-18857722

Fax: +1-36-18507563

Abstract

Diabetes Mellitus is a significant health care challenge in the United States. The Center for Disease Control and Prevention estimates approximately 9.4% of patients in the United States are afflicted by diabetes. The Infectious Disease Society of America asymptomatic bacteriuria in women as two consecutive clean-catch voided urine specimens with isolation of the same bacterial strain in counts $\geq 10^5$ cfu/mL. It is understood that diabetic patients tend to be at higher risk for infections than non-diabetics. Urinary tract infections (UTIs) tend to be the most common infection contracted by this population. UTIs are not only a significant cause of morbidity and mortality, they are also a significant financial burden. The data are conflicting, in regard to treating asymptomatic bacteriuria in diabetic patients to avoid hospital complications and ultimately decrease healthcare costs associated with these complications. However, clinicians continue to prescribe antibiotics empirically. Further randomized controlled study looking into the specific population as immunocompromised diabetic patients, patient with diabetic ketoacidosis and patient in intensive care unit needs to be undertaken.

Key words: Asymptomatic bacteriuria; Diabetes mellitus; Hospitalized diabetics; Urinary tract infection

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Core tip: Urinary tract infections among diabetics can predispose patients to significant morbidity, mortality, and increased healthcare costs. Data remains controversial as it pertains to treatment of asymptomatic bacteriuria in hospitalized diabetics in reducing the risk of urinary tract infection, complications, and healthcare costs.

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INTRODUCTION

It is known in the scientific community that diabetic patients are particularly susceptible to infections. Studies have suggested that diabetic patients are at four times higher risk of suffering from infections than non-diabetics^[1]. Among infections in diabetics, urinary tract infections (UTIs) are the most common type of infection^[2]. Prevalence of asymptomatic bacteriuria (ASB) is quite common among the diabetic population. The Infectious Disease Society of America (IDSA) ASB in women as two consecutive clean-catch voided urine specimens with isolation of the same bacterial strain in counts $\geq 10^5$ cfu/mL in men IDSA recommends a single, clean-catch, voided urine specimen with one bacterial species isolated in a quantitative count of 10^5 cfu/mL to be defined as asymptomatic bacteriuria. For any asymptomatic patient, bacteriuria is defined as a single catheterized urine specimen with one bacterial species isolated in counts $\geq 10^5$ cfu/mL^[3].

In a cross-sectional study, the prevalence of urinary tract infection (UTI) in diabetic patients was 16%^[2]. What's more important is that the prevalence of ASB in diabetic patients has been shown to be at four times higher than the general population, however, whether ASB is a common precursor to UTIs and should ASB be treated or not is still inconclusive^[4-8].

STUDY ANALYSIS

The diabetic population as whole are at higher risk for suffering from complications of UTIs which include renal and peri-renal abscess, emphysematous pyelonephritis, emphysematous cystitis, fungal infections, xanthogranulomatous pyelonephritis, and renal papillary necrosis^[2]. Among diabetics, women, were found to have a higher incidence of UTIs than their male counterparts^[3]. Consequently, diabetic women are also at higher risk of suffering from increased morbidity and mortality from UTI^[4]. A study suggested that diabetic women are as much as 6 times to 24 times more likely than non-diabetic women to be admitted for acute pyelonephritis^[5]. Whereas, diabetic men are 3.4-17 times more likely than their nondiabetic counterparts to be admitted for the same condition^[6-9].

UTIs are not only a significant cause of morbidity and mortality by elevating the risk of pyelonephritis, premature delivery, impaired renal function, and end-stage renal disease in patients, but also is a significant financial burden. The estimated annual cost of community-acquired UTI is significant, at approximately 1.6 billion USD/year and treatment of the same incurs in significant cost in the United States to about 1.6 billion dollars in 1995 with and about 25.5 billion USD over the course of 20 years^[10].

Given the clinical burden and economic cost of UTI it raises the question if the data that we currently have can be directly translated from a community over to a hospital setting and if ASB, a potentially treatable cause of UTI should be taken into consideration among the hospitalized diabetic patient?

In a study performed on hospitalized patients from 1996-2003 the rate of ASB was 12.76% (117 out of 917) and 11.4% (296 out of 2596) respectively in diabetic and nondiabetic males. The rate of ASB was 14.97% (229 out of 1529) and 13.1% (679 out of 5175) in diabetic and nondiabetic females, respectively^[17]. Furthermore, prospective study done in two tertiary care university affiliated teaching hospitals demonstrated an overall prevalence of ASB to be 7.9% (85 cases per 1072 women) and a higher likelihood to have occult upper UTIs in certain aboriginal diabetic populations with lower level of education and socioeconomic status (53% of aboriginals *vs* 20% of non-aboriginals, $P = 0.016$)^[6,9]. Studies among diabetic populations have found that the length of time with diabetes rather than diabetic control, as interpreted by hemoglobin A1c was shown to have an increased risk for both ASB and UTIs, however studies failed to mention how many, if any at all, of these patients were diagnosed in inpatient *vs* outpatient setting^[11,11]. In another study, conducted in the year 2000, risk factors for ASB for Type II Diabetic women included: Age,

macroalbuminuria, a lower BMI, and a UTI during the previous year. ASB in Type II Diabetic women was noted to be an independent risk factor for UTIs^[12]. The same study failed to demonstrate ASB as a risk factor for UTI in Type I Diabetics^[12]. Sexual activity has also consequently been associated with ASB^[13]. However, none of these studies manage to conclude any significance within the hospitalized population nor do they answer the question should treatment of ASB be beneficial to diabetic patients, particularly women. Some contest that rather than being condition or findings, we should consider this to be a complication of longstanding diabetes, along with albuminuria, and peripheral neuropathy^[12,14]. In a large multicenter prospective study with an 18-month follow up did not demonstrate any significant association with ASB and renal function decline^[15]. A long-term prospective study confirmed no significant association with ASB and renal function impairment in diabetic women at 6 years^[16].

Although, ASB does have some data that supports increased risk for symptomatic UTI, does this mean should we treat all ASB? Well, the question is more complicated than that. Should we treat depending on the pathogen? Several studies have demonstrated *E. Coli* to be the most commonly isolated bacteria in diabetic patients with ASB, this however is in keeping community acquired UTIs in non-diabetic patients as well^[1]. Other studies in hospitalized patients demonstrate the contrary with more pathogenic organisms being isolated (*Klebsiella*, *Pseudomonas aeruginosa*) however no changes in antibiotic resistance were noted in comparison with non-diabetic patients^[17,18]. Another emergency room based study demonstrated a correlation between diabetes and bacterial antibiotic resistance^[19].

CONCLUSION

The question still stands; should ASB in diabetic patients be treated? Prospective randomized control trial done in 2002 comparing antimicrobial *vs* non antimicrobial therapy approach in diabetic women with ASB and followed for 36 mo, the study found no decrease in number of symptomatic episodes of hospitalizations during long term follow up and a high rate of recurrent bacteriuria after antibiotic treatment was given. The study went further to conclude no benefit to continued screening for and treatment of asymptomatic bacteriuria^[20]. Current recommendations from the Infectious Disease Society of American Guidelines and United States Preventive Services Task Force recommend against routine screening of diabetic patients for asymptomatic bacteriuria^[4,21].

In conclusion, However, to our knowledge quality data and multiple high-quality studies are lacking. The conclusions are limited due to most of these studies focusing on the female population thus educated decisions for management of male diabetic patients is largely unclear. Further studies are required to determine the certain subpopulations of diabetic patients that would benefit, if any, especially for patients in ICU, patients with DKA or patients with significant immunosuppression from routine treatment of ASB. Some studies however have suggested the use of prophylactic measures such as probiotics may be beneficial to avoiding UTIs and its possible complications^[22]. However, significant gaps in knowledge exists among the hospitalized patients. The jury is still out!

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