

A HOSPITAL BASED PROSPECTIVE STUDY TO ESTIMATE THE PREVALENCE AND THE CLINICAL AND LABORATORY PARAMETERS OF ASYMPTOMATIC BACTERIURIA IN TYPE 2 DIABETIC PATIENTS LESS THAN 45 YEARS OF AGE AT TERTIARY CARE CENTRE

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ABSTRACT

Background: The incidence of diabetes mellitus is escalating remarkably. Diabetes mellitus has a number of long-term effects on the genitourinary system. Asymptomatic bacteriuria (ASB) is a common problem in diabetic patients and is associated with increased risk of septicaemia and pyelonephritis if untreated. This study was carried out to determine the prevalence and the clinical and laboratory parameters of asymptomatic bacteriuria in type 2 diabetic patients less than 45 years of age at tertiary care centre in north India. **Materials and Methods:** This is a hospital based prospective study done on 50 diabetic patients <45 years attending the diabetic OPD in Government Hospital Sikar, Rajasthan, India during one-year period. Non-diabetic patients < 45 years were taken as control. Midstream urine samples were collected from the study participants after getting informed consent. The urine cultures that showed growth of more than 10⁵ colonies / ml were considered as asymptomatic bacteriuria. **Result:** Among the study patients, there was no statistically significant difference in relation to age distribution between ASB +ve group (37.24±5.16) and ASB -ve group (36.25±6.68) with a p value of <0.05 as per unpaired t test and also statistical difference (P<0.05*) in relation to gender in between ASB positive & negative group. The mean duration of diabetes was significantly more in ASB +ve group compared to ASB -ve group by a mean difference of 3.79 years. This difference is significant with a p-value of <0.0001 as per unpaired t test. **Conclusion:** We suggest the need for ASB screening in female patients of our population with long duration of diabetes. Early adoption of strict glycaemic control and measures to improve genital hygiene can prevent UTI in these patients.

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycaemia. Several distinct types of DM are depending on the aetiology of the DM, factors contributing to hyperglycaemia include reduced insulin secretion, decreased glucose utilization and increased glucose production.^[1] The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system.^[1] DM leads to metabolism dysregulation which causes

secondary pathophysiologic changes in multiple organs system. As the incidence of diabetes increasing worldwide it will continue to be a leading cause of morbidity mortality.

The complication related to diabetes can produce wide range of symptoms and signs ranging from secondary to acute hyperglycaemia to those related to chronic complications that begin to appear usually during the second decade of hyperglycaemia. Diabetes leads to several abnormalities of the host defence system that may result in higher risk of certain infection including UTI.^[2] These include immunologic impairment such as impaired migration, intra cellular killing, phagocytosis,

chemotaxis of polymorphonuclear leukocytes from diabetic patients and neuropathic complications such as impaired bladder emptying.^[3,4] The increased glucose concentration in urine may serve as culture medium for various pathogenic microorganisms.^[5] Individuals with DM have a greater frequency and severity of infection. Urinary tract is the most common site for infection. Many common infections are more severe in the diabetic population, whereas several rare infections are seen almost exclusively in the diabetic population.^[1]

Lower genitourinary tract disease in diabetic patients is of particular concern because of the perception that these patients tend to have more complicated infection of upper urinary tract. Development of ASB is much more common in diabetic women than in non-diabetic women. ASB is much more common in diabetic women compared to diabetic men.^[6]

Various risk factors for ASB in women with diabetes have been suggested including sexual intercourse, age, and duration of diabetes and metabolic control.^[7-13] Also anatomic factors such as short urethra may be responsible for higher susceptibility of females to these infections. The incidence of bacteraemia due to the Enterobacteriaceae also is increased in patients with diabetes presumably because of increased incidents of urinary tract infection. Infection may be both cause and an effect of renal papillary necrosis. Renal abscess occurs with twice the frequency in persons with diabetes as in persons without diabetes. Diabetes is routinely mentioned as an important risk factor in the development of perinephric abscess.

Urinary tract infections usually present with lower abdominal pain, bladder discomfort, bladder spasm, nocturia, dysuria, urgency and frequency of micturition. These symptoms may or may not be associated with constitutional symptoms like fever, fatigue and malaise. The term asymptomatic bacteriuria refers to the presence of positive urine culture in an asymptomatic person. ASB is common in neonates, pre-school children, pregnant women, elderly people and diabetics. Various studies have been conducted to analyse the risk factors for ASB in diabetic patients. Many studies have been conducted to estimate the frequency of asymptomatic bacteriuria in diabetic men and women. There have been studies which have recommended screening of patients with diabetes to detect and treat diabetes with ASB because of increased frequency and severity of upper urinary tract infections in such patients. Most of the studies done on this condition have been in Europe and North America.^[14] The aim of this study to estimate the prevalence and the clinical and laboratory parameters of asymptomatic bacteriuria in type 2 diabetic patients less than 45 years of age at tertiary care centre in north India.

MATERIALS AND METHODS

This is a hospital based prospective study done on 50 diabetic patients <45 years attending the diabetic OPD in Government Hospital Sikar, Rajasthan, India

during one-year period to satisfy the inclusion criteria were recruited for the study.

Exclusion criteria

1. Patients with features of lower urinary tract infection (dysuria with frequency or urgency).
2. Patients who had taken antibiotics in the previous two weeks.
3. Women with history of sexual intercourse one week prior.
4. Pregnancy.
5. Instrumentation of the urogenital tract in the previous two months
6. Recent hospitalisation or surgery in past 4 months.
7. Gynaecological infections.
8. Patients with history of ureteric/renal calculus.
9. Subjects unwilling to participate are voluntarily excluded.

Study Design

The study was a cross-sectional comparative study on asymptomatic bacteriuria in Type 2 Diabetic patients < 45 years attending the diabetology OPD of our centre. Non-diabetic patients < 45 years were taken as control.

Study Protocol

During initial visit relevant details and history regarding the patients are collected like age, duration of diabetes, medications, pregnancy, history of hospitalisation, catheterization, surgery, history pertaining to urinary symptoms and gynaecological infections like dysuria, frequency of micturition, history of white discharge of pruritis vulva.

Relevant investigations like fasting and post prandial sugar, urine analysis, urine culture and sensitivity, renal function tests, ultra sound for PVR, urine microalbuminuria, screening for diabetic retinopathy and neuropathy to be carried out (Questionnaire attached)

Urine Culture

Urine was read for growth post incubation at 32°C for 24 hours on blood and McConkey agar. The urine cultures that showed growth of more than 10⁵ colonies / ml were considered as asymptomatic bacteriuria.

Statistical Analysis: Continuous variables were analysed with the unpaired t test. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as P < 0.05. The data was analysed using SPSS version 21.0v.

RESULTS

Among the study patients, there was no statistically significant difference in relation to age distribution between cases group (35.24±6.16) and control group (34.19±5.72) with a p value of <0.05 as per unpaired t test and also no statistical difference in relation to gender.

There was a statistically significant difference in relation to urine culture status between cases group

(majority are negative – 80%) and control group (majority are negative – 94%) with a p value of <0.05 as per chi squared test.

The mean FBS, mean PPBS, HBA1C, blood urea & Serum Creatinine was significantly more in cases group compared to control group by a mean difference of 107.44 mg/dl, 127.98 mg/dl, 2.25%, 15.22 mg/dl & 0.56 mg/dl respectively. This difference is significant with a p-value of <0.0001 respectively as per unpaired t test [Table 1].

Among the study patients, there was no statistically significant difference in relation to age distribution between ASB +ve group (37.24±5.16) and ASB -ve group (36.25±6.68) with a p value of <0.05 as per unpaired t test and also statistical difference (P<0.05*) in relation to gender in between ASB positive & negative group. The mean duration of diabetes was significantly more in ASB +ve group compared to ASB -ve group by a mean difference of 3.79 years. This difference is significant with a p-value of <0.0001 as per unpaired t test [Table 2].

Table 1: Various parameters among cases & control groups.

Parameters		Cases (N=50)	Controls (N=50)	P-value
Age (yrs) Mean±SD		35.24±6.16	34.19±5.72	>0.05
Gender	Male	18	17	>0.05
	Female	32	33	
Urine culture	Positive	10	3	<0.05*
	Negative	40	47	
Glycemic control parameters	FBS	198.36±56.43	90.92±9.42	<0.0001*
	PPBS	240.52±50.95	112.54±10.26	
	HBA1C	8.83±1.19	6.58±0.28	
Renal laboratory parameters	Urea	19.36±15.28	34.52±3.26	<0.0001*
	Creatinine	1.21±0.17	1.06±0.12	

Table 2: Various parameters among asymptomatic bacteriuria positive and negative in cases.

Parameters		ASB Positive (N=10)	ASB Negative (N=40)	P-value
Age (yrs) Mean±SD		37.24±5.16	36.25±6.68	>0.05
Gender	Male	2	16	<0.05*
	Female	8	24	
BMI (Kg/m ²)	Underweight	0	2	>0.05
	Normal	4	15	
	Overweight	4	17	
	Obese	2	6	
Duration of diabetes (Mean±SD)		7.03±3.05	3.24±2.26	<0.0001*

DISCUSSION

The incidence of urine culture positivity was significantly more in cases group compared to control group by a percentage difference of 14 percentage points. This difference is significant with a p-value of 0.0051 as per chi squared test. Geerling et al in 2000 reported a prevalence of 26%.^[14] Our study was similar to earlier studies with prevalence of ASB being 21%.

Asymptomatic bacteriuria is common among diabetic patients and may lead to serious complications if not properly managed.^[15] The important clinical concerns of ASB in diabetic individuals are its contribution to morbidity, either the short term risk of developing a symptomatic urinary tract infection followed by its complications or by the long term risks of developing serious diabetic complications like nephropathy.^[16] ASB has been identified as a risk factor for acquiring symptomatic UTI especially in diabetic women.^[15]

Prevalence of ASB (20%) in this study population was similar to many studies reporting prevalence estimates ranging from 8–26%,^[13,17] which was more than the 12.5% prevalence rate reported in the meta-analysis done by Renko et al.^[18] and less than 28–32% prevalence rate reported in recent Indian studies.^[19,20] Majority of ASB occurring over 40

years of age was consistent with the finding in several studies on otherwise healthy people.^[21,22] Female predilection of ASB (23.25% vs 18.91%), as evidenced in several studies,^[21,22] is due to their short urethra located close to the warm, moist, vulvar, and perianal areas that are colonized with enteric bacteria. Our study found significant association between duration of diabetes and the prevalence of bacteriuria similar to study by Bahl et al.^[23] The lack of association with HbA1c was consistent with studies by Renko et al,^[18] and Zhanel et al.^[13] This suggests that glycosuria is not an important determinant for occurrence of ASB.

The metabolism of sugar, fat, and protein in the human body affects the immune system of the human body.^[24] The human body's ability to fight pathogens decreases, the patient's urethral mucosal defense barrier function decreases, and pathogens are more likely to invade, increasing the risk of ASB infection.^[25] In this study, it was not proven that BMI is a risk factor for asymptomatic bacteriuria in patients with type 2 diabetes mellitus, and differences in race and measurement tools may have affected the analysis. However, BMI may be a risk factor for ASB because patients with higher BMI have more body fat and higher plasma osmotic pressure, which leads to lower phagocytosis of pathogenic bacteria by white blood cells.^[26] Simultaneously, the immune-

regulated pro-inflammatory cytokines involved in obesity can also lead to systemic inflammation, thus reducing patients' immunity and increasing the probability of bacterial infection. An increase in BMI causes insulin resistance and increases the incidence of infection in T2DM.^[27]

CONCLUSION

We suggest the need for ASB screening in female patients of our population with long duration of diabetes. Early adoption of strict glycaemic control and measures to improve genital hygiene can prevent UTI in these patients.

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