

PREVALENCE OF ASYMPTOMATIC BACTERIURIA AMONG WOMEN WITH DIABETES MELLITUS - A PROSPECTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Background: There are many studies demonstrating the risk factors of asymptomatic bacteriuria (ASBU) in diabetic women. ASBU is a well-established risk factor for frequent urinary tract infections (UTIs) in women, and the risk factors that predispose diabetic women to ASBU has to be further evaluated.

Aim: To estimate the prevalence of asymptomatic bacteriuria among women with diabetes mellitus. To verify if there is a correlation between bacteriuria and the duration of diabetes and also the correlation between bacteriuria with the metabolic control of diabetes.

Materials And Methods: Patients who were admitted in Sree Mookambika Institute of Medical Sciences, Kulasekharam from February 2019 to November, 2020 were included in our study. Two hundred women with diabetes mellitus were enrolled in the study. A control group of 75 healthy women were randomly selected without diabetes was also evaluated in the same period. All relevant clinical information, data was collected. Patients were categorised into variables and mean, SD, Levene's test of homogeneity of variance, linear regression was calculated.

Results: 200 diabetic women were included in our study and 75 healthy women were selected as control. The prevalence of bacteriuria among diabetic and non-diabetic women were studied. The rate of significant bacteriuria was 34.5% (69 out of 200) among diabetic women and 9.33% (7 out of 75) among those in control group ($P < 0.05$). The age of bacteriuric and non-bacteriuric diabetic women was 52.8 ± 12.0 years and 50.2 ± 10.6 years respectively ($P < 0.05$). As age advances, there is an increased risk of asymptomatic bacteriuria among diabetic women. The duration of diabetes among bacteriuric and non-bacteriuric women was 13.8 ± 6.43 years and 8.7 ± 6.26 years respectively ($P < 0.05$). Asymptomatic bacteriuria was more prevalent among diabetic women with longer duration of diabetes. The fasting plasma sugar among bacteriuric women was 155.9 ± 45.0 mg/dl and among non-bacteriuric women was 110.4 ± 34.7 mg/dl ($P < 0.05$). The postprandial plasma sugar among bacteriuric women was 241.8 ± 53.1 mg/dl and among non-bacteriuric women was 191.1 ± 46.6 mg/dl ($P < 0.05$). Asymptomatic bacteriuria was more prevalent among diabetic women with poor glycemic control. **Conclusion:** Urinary tract infection is one of the major disease burden for many patients having diabetes mellitus. Asymptomatic bacteriuria (ASB) is several-fold more common among diabetic women than healthy women. The risk of asymptomatic bacteriuria increases with increasing age. The duration of diabetes mellitus has significant correlation with development of asymptomatic bacteriuria among diabetic women. A significant impairment of metabolic control of diabetes shows an overall increase in the risk of developing asymptomatic bacteriuria.

Key words: Asymptomatic Bacteriuria–Diabetic Women–UTI

1 INTRODUCTION

Type-2 diabetes mellitus (T2DM) increases the risk of many infections. Partly due to immune and nervous system defects and partly due to elevated glucose environment within the urinary tract, it is considered as one of the major site of infection¹. Diabetes causes many acute and chronic complications. Diabetic ketoacidosis, hyperosmolar non-ketotic hyperglycemia, lactic acidosis are some of the important acute metabolic complications of diabetes². Chronic complications can either be macrovascular (cerebrovascular accident, cardiovascular disease, and peripheral vascular disease) or microvascular (neuropathy, nephropathy, and retinopathy). Urinary tract being the prevalent infection site, serious complications of urinary infection such as, renal or perinephric abscess, pyelonephritis, bacteremia, renal papillary necrosis and emphysematous cystitis occur more commonly occurring in diabetic patients³. UTIs are noted to be more common among diabetic females than males due to female gender-associated risk factors⁴. The prevalence of DM has risen dramatically all over the world over the past two decades. It has increased from an estimated 30 million cases in 1985 to 382 million in the year 2013. Approximately 592 million people are considered to be affected with diabetes as per the data provided by International Diabetes Federation.⁵⁻⁶

2 AIM

To estimate the prevalence of asymptomatic bacteriuria among women with diabetes mellitus. To verify if there is a correlation between bacteriuria and the duration of diabetes and also the correlation between bacteriuria with the metabolic control of diabetes.

3 MATERIALS AND METHODS

A prospective cross sectional study was conducted in a tertiary care centre in Tamil Nadu during the course of February 2019 To November 2020. The study was done among 200 diabetic women and 75 age matched nondiabetic women. A well informed consent was obtained in written from all participants. During initial visit relevant history was elicited like age, known duration of diabetes, medication, pregnancy, history for urinary tract infection, history of previous instrumentation, catheterization, history of white discharge and history of pruritus vulva. Gynecological examination was carried out to rule out infections of the reproductive tract. During the next visit, fasting and post prandial plasma glucose tests were done on the patients and control group. Under sterile precautions, midstream urine sample was collected. The urine samples were collected during the non- menstrual period. Two urine samples

were collected, one for microscopic examination of leucocyturia and another for culture and sensitivity. The number of white blood cells per cubic millimeter of urine was calculated using haemocytometer in microscope. Fasting and 2 hour postprandial venous blood samples were withdrawn and plasma glucose values were calculated.

Data analysis was done using SPSS 23.0. Mean, standard deviation Significance was assessed at p<0.05 level of significance.

4 RESULTS

Table 1. Demographic and Clinical Features of Study Group

	200
Age (yrs)	53.1±11.1
Duration(yrs)	7.7±6.0
Height (m)	1.54±0.15
Weight (kg)	66.0±10.8
BMI(kg/m ²)	24.6±4.5
Fasting plasma glucose(mg/dl)	125.9±44.1
Postprandial plasma glucose(mg/dl)	201.7±53.3

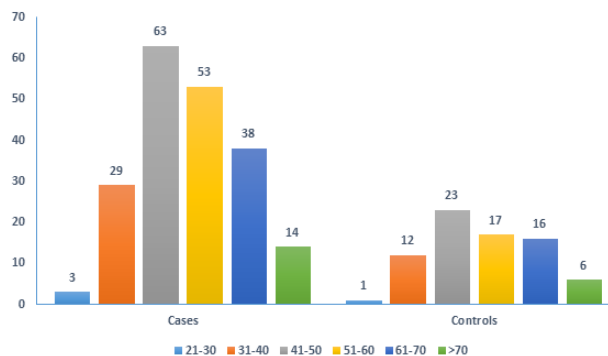


Figure 1. Age-Distribution of Cases and Controls

The youngest in the study group was 22 years and the oldest in the study group was 76 years. The youngest in the control group was 25 years and the oldest person in the control group was 72 years.

The prevalence of bacteriuria among diabetic and non-diabetic women is shown in Fig. 1. The rate of significant bacteriuria was 34.5% (69 out of 200) among diabetic women and 9.33% (7 out of 75) among those in control group (P < 0.05).

The duration of diabetes among bacteriuric and non-bacteriuric women was 13.8 ± 6.43 years and 8.7 ± 6.26 years respectively (P < 0.05). Asymptomatic bacteriuria was more prevalent among diabetic women with increased duration of diabetes as shown in Fig. 2

The fasting plasma sugar among bacteriuric women was 155.9 ± 45.0 mg/dl and among non-bacteriuric women was 110.4 ± 34.7 mg/dl (P < 0.05). The postprandial plasma sugar among bacteriuric women was 241.8 ± 53.1 mg/dl

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Table 2. Demographic and clinical characteristics of Diabetic Women with and without Bacteriuria

Characteristic	ASB+	ASB -	p Value
	68	132	
Age (years)	52.8 ± 12.0	50.2 ± 10.6	< 0.05
Duration of diabetes	9.1 ± 6.3	7.1 ± 5.6	< 0.05
Fasting plasma glucose (mg/dl)	155.9 ± 45.0	110.5 ± 34.7	< 0.05
Postprandial plasma glucose (mg/dl)	241.8 ± 53.1	191.1 ± 46.6	< 0.05

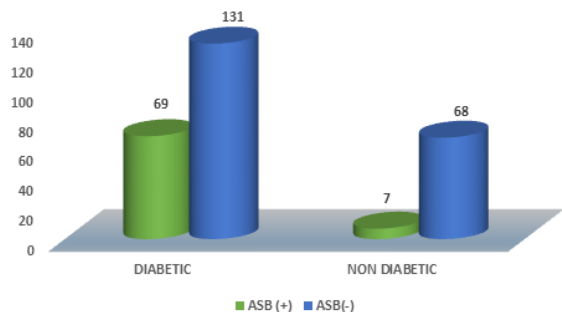


Figure 2. Prevalence of Bacteriuria Among Diabetic And Non-Diabetic Women

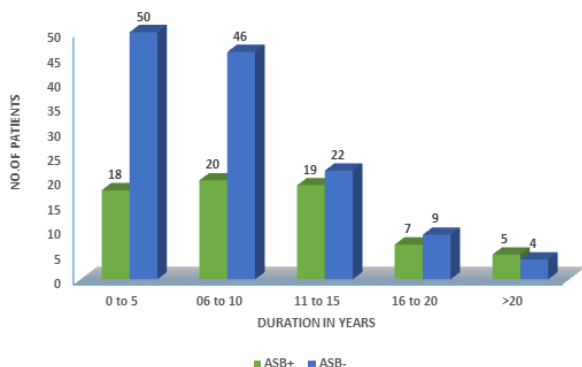


Figure 3. Duration of Diabetes among bacteriuric and non-bacteriuric Women

and among non-bacteriuric women was 191.1 ± 46.6 mg/dl (P<0.05). Asymptomatic bacteriuria was more prevalent among diabetic women with poor glycemic control. Table 2 summarises the characteristics of bacteriuric and non-bacteriuric women.

5 DISCUSSION

Diabetes mellitus refers to a group of metabolic disorders with similar phenotype of hyperglycemia. It can be either due to insulin deficiency or insulin resistance or both. DM has been commonly associated with UTI. However, it is suggested that high glucose concentration in urine may favor the growth of pathogenic microorganisms, either in the form of symptomatic UTI or ASB⁶.

The symptomatic UTI and ASB has to be differentiated. Both UTI and ASB refers the presence of bacteria in the

urinary tract, with accompanying white blood cells and inflammatory cytokines in the urine. The diagnosis of ASB is by both microbiological and clinical criteria. The clinical criterion is characterized by nil signs and symptoms due to the presence of bacteria in the urinary tract. The diagnosis of ASB is made when there is ≥10⁵ bacterial CFUs/mL, except in catheter-associated disease, in which ≥10² CFUs/mL is the cutoff value.⁷

Several studies showed significant prevalence of asymptomatic bacteriuria in women with diabetes mellitus. In the study conducted by Zaidi SM¹ et al showed the incidence of ASB in around 19% of the study population (127 out of 667 samples tested were positive). In the study done by Geerlings et al⁸, asymptomatic bacteriuria was seen in 26% of diabetic women and was 6% among non-diabetic women. In another similar study conducted by Makuyana et al⁹, in an urban black population, concluded that the prevalence of asymptomatic bacteriuria was around 32% among diabetic women and was 11 % in the control group.

In non-diabetic women, age is implicated as a major risk factor for bacteriuria. In our study also, a similar relation was found between increasing age and asymptomatic bacteriuria among the diabetic women. In the study Geerlings et al⁸ demonstrated age as one of the significant risk factor in ASB in diabetic women.

In the present study, a significant correlation has been demonstrated between the number of years with diabetes mellitus and the incidence of asymptomatic bacteriuria in women with diabetes. The duration of hyperglycemia due to DM among bacteriuric and nonbacteriuric women was 13.8 ± 6.43 years and 8.7 ± 6.26 years respectively (P < 0.05). Various studies conducted by Geerlings et al⁸ and Keanel et al¹⁰ showed there was a significant correlation between ASB and duration of diabetes. In the study by Schmitt et al¹¹, women with bacteriuria was found to have greater mean years of diabetes when compared to those without infection. (9.9+ 1.5 vs. 5.4 ± 0.4 years, P < 0.02). Edward J et al¹² showed there was significantly higher risks of asymptomatic bacteriuria and UTI in those women who had had diabetes for 10 or more years.

In this study, there is a significant correlation found between control of blood sugars and asymptomatic bacteriuria in diabetic women. Both fasting blood sugar and postprandial blood sugar levels have direct correlation with the presence of bacteriuria. It implies that a significant impairment of metabolic control of diabetes increases the overall risk of developing asymptomatic bacteriuria. In a study done among 110 patients, Kelestimur et al¹³ found a significant relation between glycosylated hemoglobin levels and bacteriuria. Mario Bonadio et al¹⁴ also found a positive correla-

tion between bacteriuria and glycated hemoglobin values; but the study did not demonstrate any significant difference statistically in the prevalence of ASB among diabetic and non-diabetic women; this may be because of the well-controlled sugar levels among most of the patients. In this study, Bharti A et al¹⁵ among the 21 ASB-positive patients, ASB had higher prevalence in patients with poor glycemic control having HbA1C >7%. Among the total 21 ASB-positive patients, 15 (71.43%) of them had HbA1c >7% and 6 patients (28.57%) had HbA1c ≤7%. Danasegaran et al¹⁶ conducted a study in which 107 diabetic patients HbA1c levels less than 7, among those 12 (11.21%) urine specimens collected demonstrated bacterial growth. Sixty-eight patients with ≥7 HbA1c levels and bacterial growth was yielded in 19 (27.94%) samples. Symptomatic UTI was present in 16.6% of patients with HbA1c levels less than 7 and among the patients with ≥7 HbA1c, 5 (26.3%) patients developed symptomatic UTI. The study concluded that poor glycemic control has a major role on ASB to develop symptomatic UTI.

LIMITATION

Our study was limited by the small sample size and lack of follow up data. Long-term follow up studies will show whether asymptomatic bacteriuria becomes symptomatic and affects renal function in diabetic patients. The study was also conducted in a predominantly lower socio economic population in a semi urban area and it might not reflect on the population as a whole.

6 CONCLUSION

In conclusion, this study demonstrated that the development of asymptomatic bacteriuria is higher in diabetic women than in women without diabetes. The incidence of ASB in diabetic women was 34.5% and among non-diabetic women was 9.33%. The study has also shown that age is a significant risk factor among diabetic women. The age among bacteriuric women was 52.8±12.0 years and among non-bacteriuric women was 50.2±10.6 years (P<0.05).

In our study, increased number of years of diabetes in women showed a relatively greater risk of asymptomatic bacteriuria. The duration of diabetes among bacteriuric and non-bacteriuric women was 9.1 ± 6.3 and 7.1 ± 5.6 years respectively.

Poorly controlled diabetes has an increased risk of asymptomatic bacteriuria in diabetic women. Statistically significant elevation of fasting blood sugar and postprandial blood sugar values was seen among the bacteriuric diabetic women (Fasting 155.9±45.0 and Postprandial 241.8 ± 53.1 mg/dl) in comparison with non-bacteriuric diabetic women (Fasting 110.5 ± 34.7 and Postprandial 191.1 ± 46.6 mg/dl).

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