Original Research Article

Asymptomatic bacteriuria in type 2 diabetic women patients who are attending Medicine OPD of Government Dharmapuri Medical College, Dharmapuri

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Abstract

Introduction: Infection is a leading cause of hospitalization among diabetic patients. Diabetes is associated with increased risk of developing infection increased severity of infection and prolonged hospital stay. Urinary tract infection, respiratory tract infection and soft tissue infection are common infections with increased incidence of diabetes. Altered host defenses, vascular abnormalities, frequent hospital admissions are responsible for increased incidence.

Aim of the study: To find out the prevalence of Asymptomatic Bacteriuria in type 2 diabetic women, to analyze the spectrum of organisms responsible for Asymptomatic Bacteriuria in this group and its antimicrobial sensitivity pattern.

Materials and methods: There was 164 participants in the study group and 56 non-diabetic women in the control group GROUP-I: Women with type 2 diabetes were recruited randomly from the Female patients of General Medicine OPD and Diabetic OPD, Government Dharmapuri Medical College Hospital, Dharmapuri. GROUP-II: Women without diabetes were selected randomly from the general population. They were relatives and friends of inpatients admitted in general medical ward. The following laboratory data were included: fasting plasma glucose, blood urea, serum creatinine, albuminuria, glycosuria, and leucocyturia. These patients were evaluated for microvascular and macrovascular complications of diabetes.

Results: Overall the prevalence of ASB was 22.56% in the study group and 5.36% in control group.

Conclusion: Asymptomatic bacteriuria was significantly more among diabetics with nephropathy. Simple bedside method to screen asymptomatic bacteriuria is leucocyturia and it has a positive predictability (72.7%) to detect bacterial isolates. Among asymptomatic bacteriuria, gram-negative isolates were greater than gram-positive ones Isolates were resistant to most of the commonly used antimicrobials (Ciprofloxacin, Ofloxacin, Gentamicin, and Cefotaxime) in clinical practice.

Key words

Asymptomatic Bacteriuria, Antimicrobial Sensitivity Pattern, Diabetes Mellitus, Diabetic Nephropathy.

Introduction

Type 2 diabetes mellitus which was previously known as noninsulin-dependent or maturity onset diabetes, is the commonest form of the disease, accounting for 85-95% of all cases worldwide and affecting 5-7% of the world's population [1]. Diabetes produces various acute and chronic complications. Diabetic ketoacidosis, hyperosmolar non-ketotic hyperglycemia, lactic acidosis are important acute metabolic complications [2]. Chronic complications include microvascular (neuropathy, nephropathy, and retinopathy) and macrovascular (cerebrovascular accident, cardiovascular disease, and peripheral vascular disease). Urinary tract being the prevalent infection site, serious complications of urinary infection such as emphysematous cystitis, pyelonephritis, renal or perinephric abscess, bacteremia and renal papillary necrosis occur more commonly in diabetic patients [3]. Many urinary tract infections are asymptomatic and whether the symptomatic urinary tract infections are preceded by asymptomatic bacteriuria (ASB) is not known in contrast with men, development of ASB in diabetic women is much more common than in non-diabetic women. Some investigators, however, have been unable to confirm this finding [4]. Due to the importance of UTI complications, observed to a greater extent in diabetic patients and because renal involvement even without the presence of symptoms (example - subclinical pyelonephritis) is common investigating the association between ASB and symptomatic UTI in women with diabetes is important. Therefore, it was determined to study ASB in type 2 diabetic women, since no published reports on this area are available from this part of the country [5]. Asymptomatic bacteriuria is frequently detected in routine investigations. This is defined as $> 10^5$ CFU/ml organisms in the urine of apparently healthy asymptomatic patients. Approximately 1% of children under the age of 1, 1% of schoolgirls, 0.03% of school boys and men, 3% of non-pregnant adult women and 5% of pregnant women have asymptomatic bacteriuria [6]. In females, asymptomatic bacteriuria increases up to 10% until an age of 65 years. There is no evidence that this condition causes renal scarring in adults who are not pregnant and have a normal urinary tract. Up to 30% of patients will develop a symptomatic infection within one year. The dilatation of the urinary tract during pregnancy allows bacteria to ascend easily to the kidneys [7].

Materials and methods

Female patients of General Medicine OPD and Diabetic OPD, Government Dharmapuri Medical College Hospital, Dharmapuri were included in the study. There was 164 participants in the study group and 56 non-diabetic women in the control group GROUP-I: Women with type 2 diabetes were recruited randomly from the Female patients of General Medicine OPD and Diabetic OPD, Government Dharmapuri Medical College Hospital, Dharmapuri. GROUP-II: Women without diabetes were selected randomly from the general population. The work was carried out from April 2017 to July 2017, continuously over a period of four months.

Inclusion criteria

Adult women with type 2 diabetes mellitus who gave voluntary consent were included.

Exclusion criteria

Those who had one or combination of the following were excluded.

- Symptoms of UTI - including dysuria, frequency, urgency, abdominal discomfort, fever etc.
- Vulvovaginitis.
- Pregnancy.
- Recent hospitalization or surgery (<4 months)
- Known urinary tract abnormalities (including cytopathy, etc.)
- Recent urinary tract instrumentation (catheterization, etc.).

All study subjects were interviewed during the first visit of the study and their medical history was obtained. This information included age, duration of diabetes, medications, and complications of diabetes. The following laboratory data were included: fasting plasma glucose, blood urea, serum creatinine, albuminuria, glycosuria, and leucocyturia. These patients were evaluated for microvascular and macrovascular complications of diabetes. Due to technical constraints practical concerns, HbA_{1C} could not be done. Due to social concerns, sexual history could not be obtained [8, 9].

Statistical analysis

Differences between patients with and without ASB were obtained through's test' for continuous variables (age, duration of diabetes, urea, creatinine). Data were analyzed by SPSS statistical software and a P value of <0.05 was considered significant. Mean values are reported as a mean ± standard deviation.

Results

There was 164 participants in the study group and 56 non-diabetic women in the control group. Their characteristics are provided below in **Table - 1** and **Table - 2** respectively.

Study group ages ranged from 31 to 80 years with a mean of 52.4 ± 11.2 and median of 52 years. Duration of diabetes in this group was between 1 to 20 years with a mean of 6.3 ± 4.5 and median of 5 years. Mean values of plasma glucose, blood urea, and serum creatinine was 7.9 ± 3.1, 3.7 ± 0.8 mmol/L and 87.2 ± 29.0 µmol/L respectively (**Table – 1**).

Control group ages ranged from 32 to 76 years with a mean of 51.1 ± 11.8 and median of 50 years. Mean values of plasma glucose, blood urea, and serum creatinine were 4.6 ± 0.6, 3.5 ± 0.2 mmol/L and 74.3 ± 10.5 µmol/L respectively (**Table – 2**).

Micro and macrovascular complications of the study group are provided. Among them, neuropathy, retinopathy and cardiovascular complications were observed in 24.3, 19.5 and 9.1% respectively (**Table – 3**).

Urine culture was positive in 37 participants in the study group and three participants in the control group which is provided in **Table - 4**, even though they were asymptomatic.

Overall the prevalence of ASB was 22.56% in the study group and 5.36% in control group. Analysis of the prevalence of ASB among study group and control group by Chi-Square test revealed that ASB was significantly more among diabetes than control (**Table – 5**).

Among the ASB positive study subjects, retinopathy, nephropathy, neuropathy, cardiovascular complications and cerebrovascular disease were observed in 24.3, 21.6, 16.2, 10.8 and 2.7% respectively. None of them had peripheral vascular disease (**Table – 6**).

The isolates (microorganisms) from urine cultures of both diabetic and nondiabetic women during the study period as per **Table - 7**.

Table - 1: Characteristics of group-I.

Characteristics	Median	Mean ± SD	
Age (years)	52.0	52.4	± 11.2
Duration of diabetes (years)	5.0	6.3	± 4.5
Plasma glucose (mmol/L)	7.2	7.9	± 3.1
Blood urea (mmol/L)	3.6	3.7	± 0.8
Serum creatinine (mo1/L)	88.0	87.2	± 29.0

Table - 2: Characteristics of control group-II.

Characteristics	Median	Mean ± SD	
Age (years)	50.0	51.1	± 11.8
Plasma glucose (mmol/L)	4.6	4.6	± 0.6
Blood urea (mmol/L)	3.5	3.5	± 0.2
Serum creatinine (mo1/L)	71.0	74.3	± 10.5

Table - 3: Study group-Micro and Macrovascular complications.

Complications	Number (164)	Percentage
Microvascular		
Retinopathy	32	19.5
Nephropathy	11	6.7
Neuropathy	40	24.3
Macrovascular		
Cardiovascular system (CVS)	15	9.1
Central nervous system (CNS)	3	1.8
Peripheral vascular disease (PVD)	5	3.0

Table - 4: Urine analysis - study subjects.

Urine analysis	Number (164)	Percentage
Proteinuria	30	18.3
Glucosuria	41	24.4
Leucocyturia	33	20.1

Table - 5: Prevalence of asymptomatic bacteriuria (ASB).

Subjects	Number (ASB positive subjects)	Percentage
Study group (n=164)	37*	22.56
Control group (n=56)	3	5.36
ASB - Asymptomatic bacteriuria, *Significant (p<0.001)		

Discussion

Asymptomatic bacteriuria in diabetes mellitus should be considered and looked for while diabetic patients come for review. In this study 37 out of 164 type 2 diabetic women had asymptomatic bacteriuria and the prevalence of ASB was 22.56% [10]. Like most other earlier studies, here also Escherichia coli was the most prevalent microorganism (45.9%) isolated from urine culture [11]. In control group, three subjects had positive urine culture, out of which two were E.coli. Lee et al. observed that E.coli was the predominant microorganism in UTIs in diabetic patients, but E.coli occurs in

significantly lower numbers than in control subjects, similar to the present study [12]. In a few studies the microorganisms were different. For example, Klebsiella was the most common organism in the Alebiosu study. In this study, Klebsiella is the second common organism (27%). Coagulase-negative staphylococci (10.8%), Staphylococcus aureus (13.5%) and Enterococci (2.7%) are the other organisms isolated in this study group. most of the E.coli strains were sensitive to Amikacin, Gentamicin and Cefoperazone sulbactam. About half of them were resistant to Ciprofloxacin, Ofloxacin, and Cefotaxime. All Klebsiella strains were sensitive to Amikacin and Cefoperazone sulbactam. Approximately 30% of them resistant to Ciprofloxacin, Ofloxacin, Gentamicin, and Cefotaxime [13]. In this study, bacteriuria had a significant association with nephropathy ($p<0.001$) and elevated serum creatinine ($p<0.001$). Altered host defense mechanism in diabetes may be aggravated by the development of nephropathy in diabetic patients and in turn, it increases the prevalence of ASB [14]. Some studies showed that the presence of long-standing complications (peripheral neuropathy, peripheral vascular disease) increased the risk of developing ASB. But here, except nephropathy, no other diabetic complications had a significant association with ASB [15]. Some studies had shown that glycemic control had no association with ASB. But here, ASB had a significant association with fasting plasma glucose levels, but this may be unreliable because, plasma glucose levels highly variable with drugs (oral hypoglycemic agents or insulin), dietary intake and physical activity [16]. Even though age is a well-known risk factor for bacteriuria in women without diabetes and some studies have shown age as the most important risk factor for ASB in type 2 diabetic patients. However, age had no significant relation with ASB in this study ($p=0.2206$) [17]. Considering these risk factors, blood glucose is a highly variable factor, which depends on dietary intake, physical activity, and regularity of treatment. The renal threshold to glucose is variable in different individuals and also in the same individual at different times. Hence glucosuria can not be considered as a sole criterion [18]. Since leucocyturia had a significant association with ASB ($p<0.001$), this test can be used as a simple and cost-effective screening test in a primary health care level. Positive cases can be sent to higher centers for urine culture and sensitivity. Based on the availability and accessibility at the rural level, an algorithm has been developed, to assess and manage asymptomatic bacteriuria in diabetic women in [19].

Table - 6: Characteristics of ASB positive study subjects.

ASB positive study	Number (n=37)	%
Age group (years)		
30-40	6	16.2
41-50	11	29.7
51-60	16	43.2
>60	4	10.8
Duration of diabetes (years)		
<5	17	45.9
5-10	12	32.4
>10	8	21.6
Complications of diabetes		
Retinopathy	9	24.3
Nephropathy	8	21.6
Neuropathy	6	16.2
CVS	4	10.8
CNS	1	2.7
PVD	Nil	-
Urine analysis		
Glucosuria	19	51.3
Proteinuria	26	70.0
Leucocyturia	24	64.8

Conclusion

Asymptomatic bacteriuria has been demonstrated in type 1 and types 2 diabetes mellitus, however, the prevalence varied in different series. The paucity of prospective studies from India made to initiate one such work in this part of the country. The aims and objectives were to find out the prevalence of asymptomatic bacteriuria in type 2

diabetic women, to analyze the spectrum of organisms and its drug sensitivity pattern, to correlate asymptomatic bacteriuria with patient status and to design an algorithm to detect and manage. Earlier studies did not show any increase in the incidence of ASB in elderly population with diabetes [20].

Table - 7: Microorganisms isolated.

Microorganisms	**Number (n=37)**	**%**
Escherichia coli	17	45.9
Klebsiella	10	27.0
Coagulase negative staphylococci	4	10.8
Staphylococcus aureus	5	13.5
Enterococci	1	2.7
Control subjects (n=3)		
Escherichia coli	2	66.6
Klebsiella	1	33.3

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