

A Clinical and Microbiological Profile of Urinary Tract Infection in Diabetes Mellitus Patients, a South India Perceptive

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A B S T R A C T

Introduction: Asymptomatic bladder infection that is detected by a positive urine culture is also common among diabetes mellitus patient which progress to symptomatic infection and subsequent complication. Therefore it becomes essential to screen urinary tract infection in diabetes mellitus patient so that its progress to complication can be prevented. Hence present study has been designated to know the clinical, microbiological profile and antimicrobial sensitivity pattern of organism that causes UTI in diabetes mellitus patient.

Material and methods: Based on exclusion and inclusion criteria 100 patients were included in this study, A detailed history of the patient were taken with respect to duration of diabetes and its symptoms complication, type and treatment. Regarding urinary tract infection, history was taken with respect to dysuria, burning, suprapubic pain; urgency, increased frequency and haematuria fever with chill rigor and vomiting suggestive of acute pyelonephritis.

Result: Out of 100 patients 36 patients have bacteriuria and 64 patients were without bacteriuria. Patient with HbA1C% above 10, who were suffering from UTI were 43, out of them 21 having bacteria in urine. The P value was 0.0642 and chi-square statistic was 5.496, which is not significant. Regarding relation between FPG and UTI, those patient whose FPG was less than 110mg/dl., five of them have UTI and four have bacteria in urine and one were without bacteriuria.

Conclusion: bacteriuria was more common in female then male and patient above 50 year of age are more affected then younger one. Patient with type 2 diabetes mellitus and treated with oral hypoglycaemic agent are effected more frequently. Bacteriuria was more common in patient whose glycosylated haemoglobin was more than 10% and fasting plasma glucose was more than 200mg/dl. Patients having neuropathy are more prone to UTI. Most common organism isolate were E.Coli and were sensitive to cephalosporins and aminoglycosides.

Keywords: Diabetes Mellitus, Bacteriuria, Urinary Tract Infection, Microbiological Profile

INTRODUCTION

Diabetes mellitus is a chronic disease that occurs; either when the pancreas is not able to produce sufficient insulin or body is not able to use the insulin it produces.¹ The global prevalence of diabetes among adults over 18 yrs of age has risen from 4.7% in 1980 to 8.5% in 2014.² Patient with diabetes mellitus are at higher risk of infection due to multiple abnormalities in the immune system. Patients are not only at higher risk of infection but also the course of infection is also more complicated than normal patients. Various factors are found to be responsible for abnormality in the immune system of diabetes mellitus patients. It has been found in various studies that there is deficiency of C4 compliment in diabetes mellitus. Secretion IL-1 and IL-6 are less by mononuclear cells and monocytes in diabetes mellitus patients. Increased formation of advanced glycosylation end

product reduce the expression of class I MHC and impair cell immunity.^{3,4} Chemotaxis of polymorphonuclear cells are also impaired, in addition to this, adherence phagocytes and killing ability of PMC are also compromised in diabetes mellitus patients.⁵ Autonomic neuropathy due to diabetes mellitus leads to dysfunction of bladder.⁶ These entire factors contribute to the pathogenesis of increase risk of urinary tract infection in diabetes mellitus patient. Asymptomatic bladder infection that is detected by a positive urine culture is also common among diabetes mellitus patient which progress to symptomatic infection and subsequent complication. Therefore it becomes essential to screen urinary tract infection in diabetes mellitus patient so that its progress to complication can be prevented. Hence present study has been designated to know the clinical, microbiological profile and antimicrobial sensitivity pattern of organism that causes UTI

in diabetes mellitus patient. Primary objective of this study was to study the clinical pattern and risk factor of urinary tract infection and secondary objective to know the causative organism and sensitivity pattern of organism isolated.

MATERIAL AND METHODS

Present study was a prospective cross sectional study conducted in the department of general medicine from January 2017 to October 2019. Patients having history of diabetes with fast plasma glucose more than 126 mg/dl and post prandial plasma glucose more than 180mg/dl, with clinical and microbiological evidence of urinary tract infection were enrolled for this study.

Exclusion criteria

1. Catheterisation
2. Antibiotic use within 15 days
3. Anomalies of genitor urinary tract.

Inclusion criteria

1. Patient with DM
2. Both Sex
3. Symptom of UTI

Based on previous study considering confidence interval 95% power of the study 80% and simplification level of 5% the sample size was calculated to be 84. Before start of the study institutional ethics committee approval was taken and a written informed consent was taken from all patients before enrolling them for study.

Method

Based on exclusion and inclusion criteria 100 patients were included in this study, A detailed history of the patient were taken with respect to duration of diabetes and its symptoms complication, type and treatment. Regarding urinary tract infection, history was taken with respect to dysuria, burning, suprapubic pain; urgency, increased frequency and haematuria

fever with chill rigor and vomiting suggestive of acute pyelonephritis. All patients were examined for sign of UTI like fever, pulse, BP, suprapubic tenderness costovertebral angle tenderness, examination of abdomen.

Under all aspartic condition mid stream urine was collected and sample was sent to laboratory for routine examination and culture. Culture of urine, Mac-conkey’s agar, blood agar and chocolate agar was used and culture urine sample were incubated at 37° C for 24 to 48 hour and isolated organism were identified by colony characteristic, lactose fermentation and biochemical analysis. Kerby-Bauer disk diffusion test was used for antibiotic sensitivity of the organisation.⁸ Complete blood count, fasting and post prandial plasma glucose was done and USG of the patient done to know the residual volume and any other pathology associated.

STATISTICAL ANALYSIS

Data was collected on excel sheet and analysed by SPSS software version17. For analysis of data chi-square test and compared t-test was used. The p-value less than 0.05 were considered statistically significant.

RESULT

During this one year ten month period 100 patients were enrolled in this study based on exclusion and inclusion criteria. Out of 100 patients 36 patients have bacteriuria and 64 patients were without bacteriuria.

As per table 1 regarding relation between the patients of urinary tract infection with bacteriuria and without bactriurea, in relation to sex, out of 50 male,16 have UTI with bactriurea and 34 having UTI without bactriurea. In female patients, 20 have bactriurea and 30 have UTI without bactriurea. This finding is not significant statistically as P value is 0.4046. In present study, 4 patients having bactriurea were below 40yrs of age and 4 patients have UTI without bactriurea were below

Patient variables		Patient with bactriurea	Patient without bactriurea	P value
Number of patients		36	64	
Sex	Male 50	16	34	0.404657 chi square statistic 0.6944
	Female 50	20	30	
Age	>40 yrs	4	4	0.7684 chisquare statistic 1.8252
	40-50 yrs	8	14	
	51-60 yrs	10	18	
	61-70 yrs	12	20	
	>70 yrs	2	8	
Types of diabetes mellitus	Type I	8	6	0.0566
	Type II	26	58	
Type of treatment	Insulin	8	6	0.1799
	Oral drug	24	52	
	Both	4	6	
Hb Alc(%)	<6.5	1	4	0.0642 chisquare statistic 5.496
	6.6 to 10	14	38	
	>10	21	22	
Fasting plasma glucose (mg/dl)	<100	4	1	0.109197
	111 to 200	14	27	
	>200	18	36	

Table-1: Demography and clinical characteristic of patients

40 yrs of age. Twenty two patients were between 41 to 50 yrs of age out of that 8 patients have UTI with bacteriuria and 14 patients have UTI without bacteriuria. Number of patients between 51 to 60yrs were 28, out of that 10 have bacteriuria 18 having UTI without bacteriuria. Patients with UTI between 61 to 70yrs were 32, out of that 12 have bacteriuria and 20 were without bacteriuria. Total ten patients were above 70 yrs of age out of that 2 having bacteriuria and UTI and 8 having UTI without bacteriuria. Regarding type of diabetes and its relation to UTI, out of 100 patients 14 were diagnosed as type-1 out of that 8 having UTI with bacteriuria and 6 have UTI without bacteriuria. Type 2 diabetes patients were 64, out of that 26 were suffering from UTI and having bacteriuria, and, 58 having UTI without bacteriuria. In relation to type of treatment 14 patients who were treated with insulin have developed UTI out of that 8 have bacteriuria and 6 have not bacteriuria. Oral hypoglycaemic were used by 76 patients having UTI out of that 24 patient have bacteriuria in remaining patient there was no bacteriuria. Insulin and oral hypoglycaemic agent both were used in 10 patients out that 4 patients have bacteriuria. This finding was not significant statistically as P value was 0.1799. Patient with HbA1C value from 6.6% to 10% were 52. Out of than 14 have bacteriuria and 38 have no bacterium in urine. Patient with HbA1C% above 10, who were suffering from UTI were 43, out of them

21 having bacteria in urine. The P value was 0.0642 and chi-square statistic was 5.496, which is not significant. Regarding relation between FPG and UTI, those patient whose FPG was less than 110mg/dl., five of them have UTI and four have bacteria in urine and one were without bacteriuria. Those patient whose FPG were 111 mg/dl to 200 mg/dl were 41 in number, out of that 14 have bacteriuria and 27 were without bacteriuria. In 54 patient with UTI, FPG was more than 200mg/dl out of 54 patients, 18 have bacteria in urine and 36 patients urine bacteria was absent.

As per table -2, regarding relation between complication of DM and urinary tract infection neuropathy was present in 58 patients. Out of that 24(66.67%) patient have bacteriuria and 34(53.12%) patient have no bacteria in urine. Nephropathy was present in 20 patients with UTI out of that 12 have bacteria and 8 patients have no bacteria in urine. There were 24 patients with UTI who has diabetic food ulcer as well. Out of than 18 have bacteria in urine and 6 were without bacteriuria. Retinopathy was present in 24 patients with UTI an out of then, 14 have bacteriuria and 10 have no bacteria in urine. Ischemic heart diseases was present in 24 patients with UTI, out of that 10 have bacteria in urine and 14 have no bacteriuria.

From table-3, E coli was found in 16 patients that is (44.45%). Klebsiella spp was found in 8 patients that is (22.23%). Out of 36 bacteriuria patients, 4 patients have Enterococcus in urine, pseudomonas was isolated from 4 sample that is (11.22%). Acinetobacter was present in two samples and Candida was isolated from renaming two samples.

Regarding resistance to antimicrobial among organism isolated as per table-3, 10 out of 18 E. Coli isolated were sensitive to fluoroquinolones, 6 were sensitive to piperacilline, and 12 were sensitive to piperacillin + tazobactam. Sensitivity to meropenem was found in 14 samples.

Klebsiella SPP isolated was sensitive to meropenem, imipinane, ceftriaxone, ceftazidime, aminoglycosides, piperacillin and Fluoroquinolones. Enterococcus were sensitive to imipinane and linazolid. Pseudomonas was sensitive to Fluoroquinolones, imipinane, meropenem. Acinatobacter were sensitive to aminoglycosides,

DISCUSSION

As per selection criteria one hundred patients were enrolled for present study, out of them 36 patients have bacteriuria

Complications	With bacteriurea	Without bacteriurea
Neuropathy	24(66.6%)	34(53.12%)
Nephropathy	12(33.34%)	8(12.5%)
Diabetic foot	18(50%)	6(9.37%)
Retinopathy	14(38.9%)	10(15.62%)
IHD	10(27.8%)	14(21.8%)

Table-2: Relation between complication of diabetes mellitus and UTI

Bacteria	Number	%
E.coli	16	44.45
Klabsiella SSP	8	22.23
Enterococcus	4	11.12
Pseudomonas	4	11.12
Acinctober	2	5.5
Candida	2	5.56

Table-3: frequency and type of organism isolated.

	E.coli	Klabsiela SSP	Enterococcus	Pseudomonas	Acinctobactria
Aminoglycosides	10	4	1	2	1
Fluoroquinolones	4	2	1	1	0
Amoxicillin	6	2	1		
Ceftriaxone	6	4			
Ceftazidime	10	5		1	1
piperacillin +tazobacton	12	4	1		1
meropenem	14	4		3	1
Imipinane	13	6	3	3	1
Vancomycin			1		
Linazolid			4		
Cotrimoxazole	2	2	1		

Table-4: Sensitivity to antimicrobial among organism isolated.

and 64 patients have UTI without bactriurea. This finding is supported by the work of Kalpana D.V. et al and Viswanath et al.^{9,10} Bactriurea was more common in female than male but it was not significant statistically. This finding is supported by the work of Bissong ME et al.¹¹ Urinary that infection is common between 50 to 70yrs of age and UTI without bactriurea is more common than bactriurea. This is supported by the work of Banerjee m et al.¹² We have observed that UTI is common with type-2 Dm then type-1 and is associated with oral therapy more commonly. But this finding is not significant statistically which corroborates with the study of Nitzan o et al.¹³

Regarding glycemic control and UTI with bacteriurea, patients with glycosylated haemoglobin from 6.6% to 10% and above have more incidence of bactriurea. Similar patient with FPG above 200 have UTI and bactriurea 111mg/dl. This finding is not significant statistically. Our finding is supported by the work of lenher sm et al.¹⁴

Regarding complication of diabetes mellitus and urinary tract infection with, or without bacteria, diabetics neuropathy, detroser instability and urothelial dysfunction is major cause of UTI, out of bacteriuria patients 66% has nephropathy and in without bactriurea group 53.12% has nephropathy, This finding is supported by study of Golbidi et al.¹⁵ Out of 100 patient 20 have nephropathy, and bactriurea is more common, this finding corroborates with the study of Zhanel 64 et al and Papazafropoulou A et al(16,17)

Bactriurea was common finding in patients with other complication of diabetes also, that is diabetic foot, retinopathy and IHD. In diabetic foot and retinopathy patient bactriurea was more common and in IHD patient UTI without bacteriuria was more common. This finding is supported by the work of Vejlsgaard R et al.¹⁸

In present study out of 36 patients with bactriurea, most common organism isolated was E.coli followed by Klebsiella. Other organisms isolated were Acinatobactor, pseudomonas, Enterococci and Candida. This finding is supported by the work of Kumar R et al but Kiranmala K et al has found that Enterococcus is second most common organism after E.coli.^{19,20} Most of the E.coli were sensitive to meropenem, imipinam and piperacillin, Klebsiella were also sensitive to ceftazidime, meropenem, piperacillin, but there is variation in the sensitivity pattern for antimicrobial agent by various author. Gutema T et al has reported that E.coli was highly sensitivity to Ceftriaxone and Klebsiella was highly sensitive to Ceftriaxone. Mama M et al has reported that E.Coli are highly sensitive to amoxicillin and chloremphenicol but Klebsiella was sensitive to trimethoprim and erythromycin.^{21,22}

CONCLUSION

To conclude bacteriuria was more common in female than male and patient above 50 year of age are more affected than younger one. Patient with type 2 diabetes mellitus and treated with oral hypoglycaemic agent are effected more frequently. Bacteriuria was more common in patient whose glycosylated haemoglobin was more than 10% and fasting plasma glucose was more than 200mg/dl. Patients having neuropathy are more prone to UTI. Most common organism

isolate were E.Coli and were sensitive to cephalosporins and aminoglycosides.

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