



Asymptomatic bacteriuria in patients with Type-2 Diabetes mellitus

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Abstract

Introduction: Asymptomatic bacteriuria is a common problem in patients with diabetes mellitus it is more common in females if untreated it leads to life threatening complications like pyelonephritis, emphysematous cystitis, perinephric abscess and renal papillary necrosis.

Objective: This study was conducted to know the prevalence and clinical profile of asymptomatic bacteriuria in patients with diabetes

Methodology: Type-2 DM patients with asymptomatic urinary tract infection was selected and urine culture, antibiotic sensitivity pattern was studied.

Results: Among 80 diabetics patients 46(57.5%) had asymptomatic bacteriuria. Escherichia coli were the most prevalent organism and was sensitive to Nitrofurantoin in 89.5% cases and meropenem in 68.4% cases.

Introduction

Diabetes mellitus is a common metabolic disorder characterised by variable degrees of insulin resistance, impaired insulin secretion and increased glucose production. According to WHO India had 69.2 million people living with diabetes in 2015. Nearly 98 million people in India may develop type-2 diabetes by 2030. Diabetes produces various complications like diabetic ketoacidosis, hyperosmolar nonketotic hyperglycaemia, lactic acidosis, microvascular (neuropathy, nephropathy, and retinopathy) and macrovascular complication (cerebrovascular accident, cardiovascular disease, and peripheral vascular disease). Diabetic patients have an increased risk of infections, especially urinary

tract infection is the most frequent site. Urinary tract infection may be symptomatic and asymptomatic. Many urinary tract infections are asymptomatic and whether symptomatic urinary tract infections are preceded by asymptomatic bacteriuria. Urinary tract infections are likely to be more severe in diabetic than non-diabetic patients.

Asymptomatic bacteriuria is defined as $>10^5$ colony forming unit (CFU) per ml of 1 or 2 bacterial species in clean voided midstream urine sample from an individual without symptoms of a urinary tract infection like dysuria, frequency, urgency, abdominal pain, and fever. Some studies showed that prevalence of ASB was detected in 33.2% of participants; 38.3% in diabetics and

26.1% in non-diabetics. Various impairments in the immune system such as impaired migration, intracellular killing, phagocytosis and chemotaxis of polymorphonuclear leukocytes seen in diabetic patients and neuropathic complications such as impaired bladder emptying may all contribute to the pathogenesis of urinary tract infections. Factors that were found to enhance the risk for UTI in diabetic include age, metabolic control, and long-term complications primarily diabetic nephropathy and cystopathy. UTI is one of the most important cause of morbidity in diabetic patients. Untreated asymptomatic bacteriuria predisposes the individual to recurrent UTI which can cause renal diseases like pyelonephritis, emphysematous cystitis, perinephric abscess, bacteraemia and renal papillary necrosis. Hence this study was done to know the proportion of type-2 diabetic patients with asymptomatic bacteriuria and to analyse the organisms responsible for asymptomatic bacteriuria and its anti-microbial sensitivity pattern.

Materials and Methods

Study Area and Design

This study was done at sri manakula vinayagar medical college and hospital from march 2019 to September 2019 for a period of 7 months. Sri manakula vinayagar medical college is a tertiary care hospital located at madagadipet, Puducherry. The study design employed was a cross sectional study.

Study Participants

The sample size was calculated to be 80 patients using the formula $4pq/d^2$ where p=prevalence q=100-p, d-relative precision of 20% with 10% non-response rate. Study participants were those who got admitted in the wards of the medicine department with diabetes.

Patients included were those all patients who are admitted or attending opd with type-2DM and diagnosed as urinary tract infection based on urine microscopy between in the age group of 20-80 years. H/O of antibiotic therapy in previous two weeks, patients with anatomical anomalies of

urinary tract, urinary catheterization, and previous history of urinary tract infection were excluded.

Methodology

Patients with type-2 DM who are diagnosed with urinary tract infection based on urine routine were identified after getting informed consent and questionnaire was used to identify the patients with symptomatic or asymptomatic urinary tract infections. If patient are asymptomatic a clean catch mid-stream urine sample was collected in a sterile container and processed in the microbiology laboratory of sri manakula vinayagar for urine culture and antibiotic sensitivity and resistance pattern. Blood samples was collected for complete blood count, and renal profile. The prevalence of asymptomatic bacteriuria among 80 diabetic patients and organisms responsible for it, antimicrobial sensitive and resistance pattern of asymptomatic bacteriuria was noted.

Statistical Analysis

Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. MS Excel and MS word was used to obtain various types of graphs such as bar diagram, pie diagram.

Results

A total of 80 diabetic patients were selected in this study. Out of 80 diabetic patients in the study group 46(57.5%) were found to have asymptomatic bacteriuria and 34(42.5%) were found to have symptomatic bacteriuria. Among 46 asymptomatic bacteriuria patients 33 were females and 13 were males [Table 1 & 2]. Majority of patients were in the age group of mean 58.3 years. The distribution of urine isolates in asymptomatic bacteriuria is presented in [Table 3]. Among 46

patients 25(54.4%) had presence of organisms in urine and 21(45.6%) participants had no growth.

Table 1: Distribution of Asymptomatic bacteriuria in type 2 DM patients

Group	Number	Percentage
Asymptomatic	46	57.5
Symptomatic	34	42.5
Total	80	100.0

Figure-1

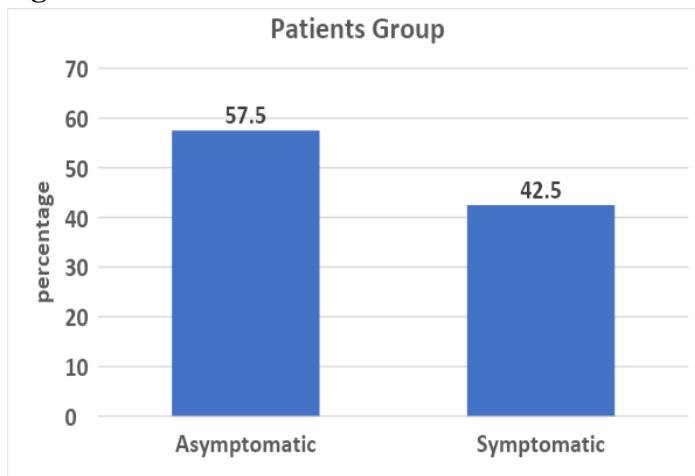


Table 2: Gender distribution in asymptomatic bacteriuria

Gender	Number	Percentage
Male	13	28.3
Female	33	71.7
Total	46	100.0

Figure-2

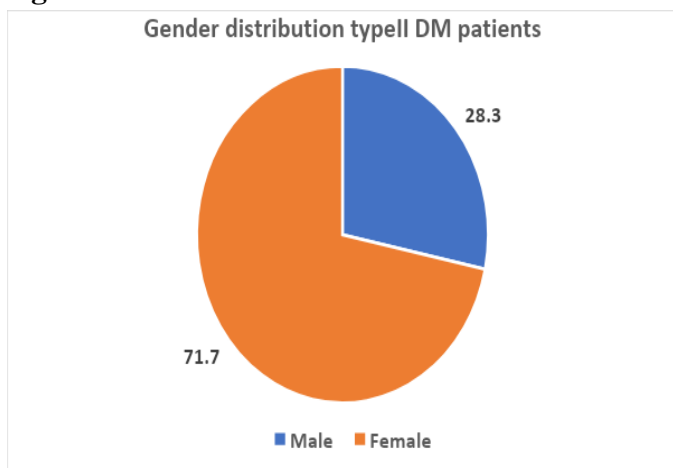


Table 3: Distribution of urine isolates among asymptomatic bacteriuria patients

Urine isolates	Number	Percentage
Absent	21	45.6
Present	25	54.4

Figure-3

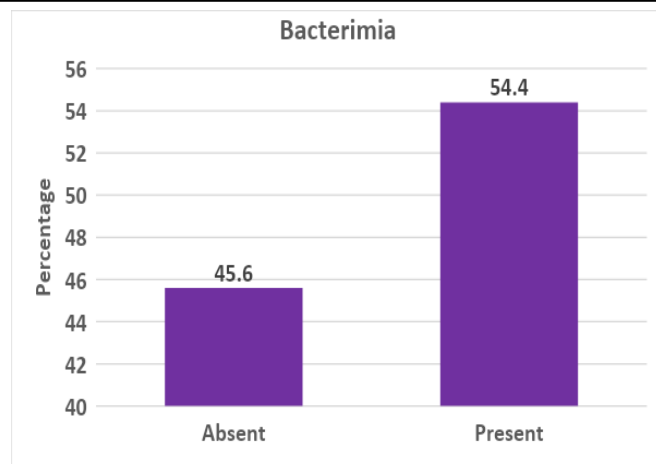


Table 4: Mean and SD value of age and various laboratory parameters in this study

Parameter	Mean (SD)
Age	58.3 (11.2)
FBS	175.2 (78.3)
PPBS	256.8 (86.7)
Duration of DM (Years)	7.8 (3.4)
Urea	38.8 (25.4)
Creatinine	1.5 (1.2)
Total count	10067.4 (3641.9)

Table 5: Behavioural characteristics Among the behavioural characteristics studied 38% were alcoholic and 38% were smoker

Behavioural	Yes n (%)	No n (%)
Alcoholic	8 (17.4)	38 (82.6)
Smoking	8 (17.4)	38 (82.6)

Figure-4

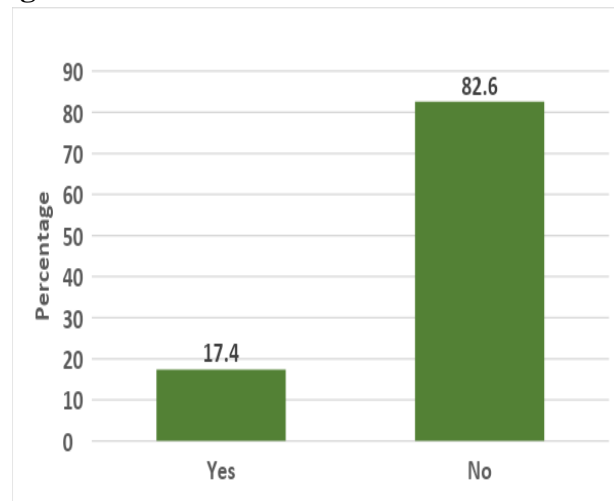


Figure-5

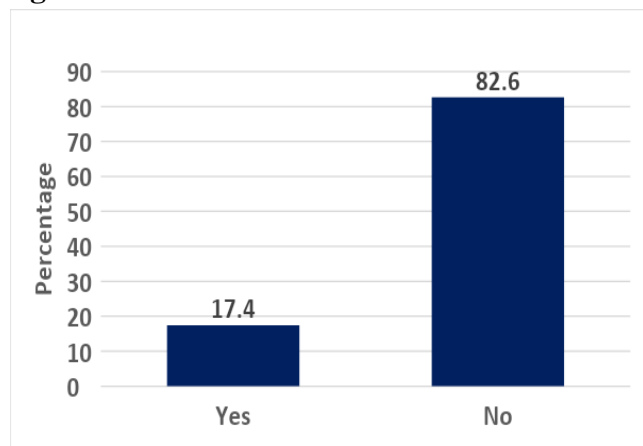
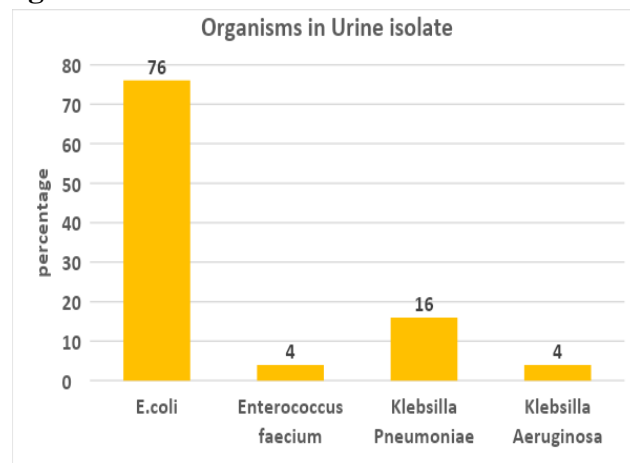


Figure-6



The most common organisms isolated was Escherichia coli 19(76.0%) followed by klebsiella pneumoniae 4(16.0%), Enterococcus faecium 4(4.0%), klebsiella Aeruginosa 4(4.0%). [Table 6]

Antibiotic sensitivity pattern for E.coli was Nitrofurantoin (89.5%) followed by meropenem (68.4%), and gentamycin (47.4%) and resistant pattern for E.coli was ampicillin followed by ceftriaxone and ceftazidime. [table 7 & 8].

Table 6: Distribution of urine isolates among diabetics with asymptomatic bacteriuria

Urine isolates	Number	Percentage
E. coli	19	76.0
Enterococcus faecium	1	4.0
Klebsiella Pneumoniae	4	16.0
Klebsiella Aeruginosa	1	4.0
Total	25	100.0

Table 7: Antibiotics sensitivity pattern for organisms among patients with asymptomatic bacteriuria

Urine isolates	Number	Nitrofurantoin	Ceftriaxone	Ceftazidime	Ampicillin
E.coli	19	17 (89.5%)	0 (0)	5 (26.3%)	2 (10.5%)
Enterococcus faecium	1	1 (100.0%)	5 (26.3%)	1 (100.0%)	0 (0)
Klebsiella Pneumoniae	4	2 (50.0%)	2 (50.0%)	1 (25.0%)	2 (50.0%)
Klebsiella Aeruginosa	1	1 (100.0%)	1 (100.0%)	0 (0)	0 (0)

Urine isolates	Number	Gentamycin	Norfloxacin	Tobramycin	Cefazolin	Meropenam
E.coli	19	9 (47.4%)	6 (31.6%)	5 (26.3%)	6 (31.6%)	13 (68.4%)
Enterococcus faecium	1	1 (100.0%)	0 (0)	1 (100.0%)	1(100.0%)	1 (100.0%)
Klebsiella Pneumoniae	4	2 (50.0%)	1 (25.0%)	2 (50.0%)	2 (50.0%)	2 (50.0%)
Klebsiella Aeruginosa	1	0 (0)	1 (100.0%)	1 (100.0%)	1(100.0%)	0 (0)

Figure-7

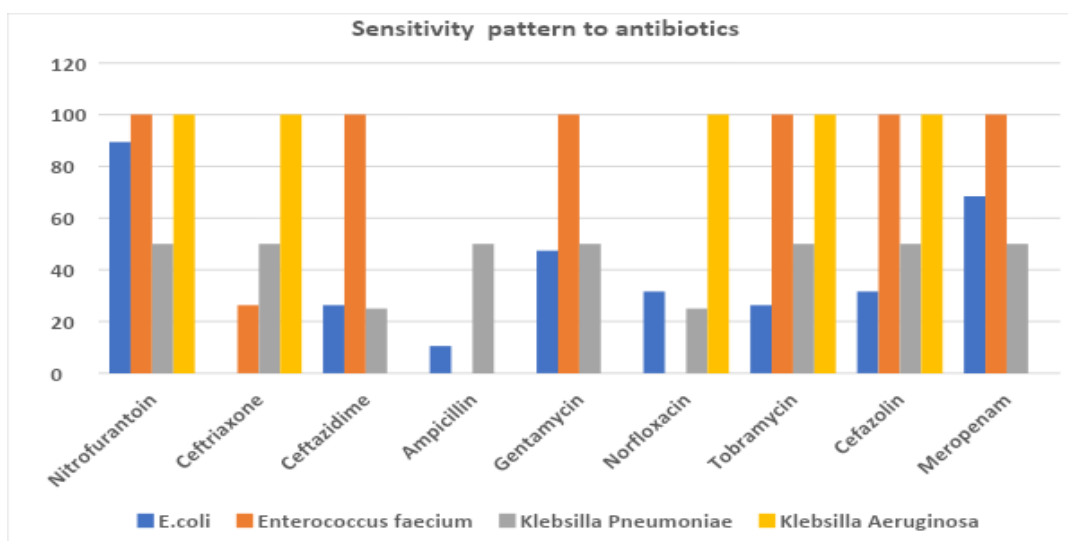


Table 8: Antibiotics resistant pattern for organisms among patients with asymptomatic bacteriuria

Urine isolates	Number	Nitrofurantoin	Ceftriaxone	Ceftazidime	Ampicillin
E.coli	19	2 (10.5%)	14 (73.7%)	14 (73.7%)	17(89.5%)
Enterococcus faecium	1	0 (0)	0 (0)	0 (0)	1(100.0%)
Klebsiella Pneumoniae	4	2 (50.0%)	2 (50.0%)	3 (75.0%)	2 (50.0%)
Klebsiella Aeruginosa	1	0 (0)	0 (0)	1 (100.0%)	1(100.0%)

Urine isolates	Number	Gentamycin	Norfloxacin	Tobramycin	Cefazolin	Meropenem
E.coli	19	10 (52.6%)	12 (63.2%)	10 (52.6%)	12(63.2%)	1 (5.3%)
Enterococcus faecium	1	0(0)	1 (100.0%)	0 (0)	0 (0)	0 (0)
klebsiella Pneumoniae	4	2 (50.0%)	3 (75.0%)	2 (50.0%)	2 (50.0%)	1 (25.0%)
Klebsiella Aeruginosa	1	1 (100.0%)	0 (0)	0 (0)	0 (0)	0 (0)

*In E.coli out of 19, antibiotic resistance culture is not done for Norfloxacin one patient (5.3)

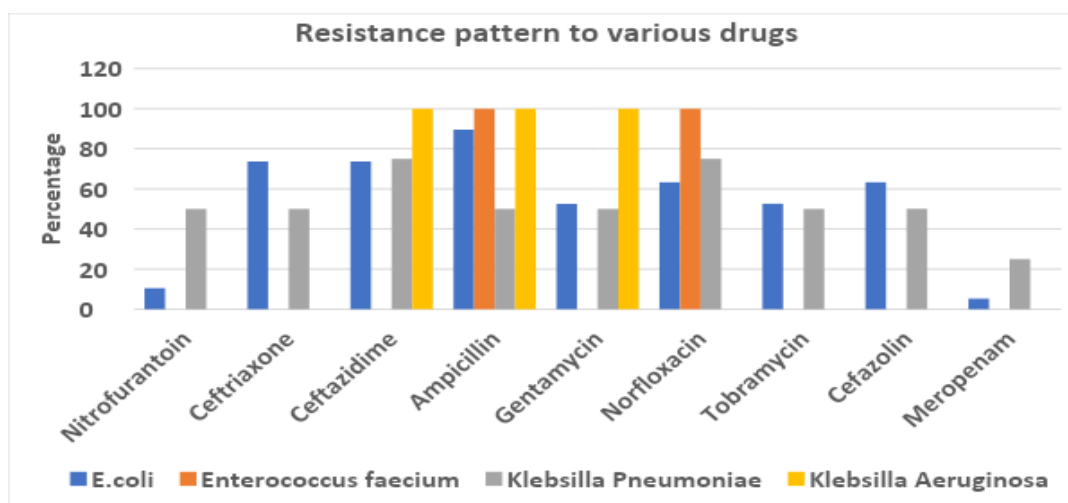
* In E.coli out of 19, antibiotic resistance culture is not done for Tobramycin in four (21.0%) Patient

*In E.coli out of 19, antibiotic resistance culture is not done for Cefazolin one patient (5.3)

*In E.coli out of 19, antibiotic resistance culture is not done for Meropenem 5 (26.3) patient

*In Klebsiella Pneumoniae out of 4, antibiotic resistance culture is not done for Meropenem for one patient (25%).

Figure-8



Discussion

In our study the prevalence of asymptomatic bacteriuria among 80 diabetic patients was significantly higher 57.5%, this study results was very similar with other study done by Kalpana Devi Venkatesan et al (32%) in 2015¹ and 33.2% by Marie E A Bissong² 2013 and Shubham Singhal³ et al showed 28.2% prevalence in 2014³. However, our study showed higher prevalence when compared to other studies. In this study ASB was more in diabetic females when compared to males like previous study Awadh A.et⁴ al showed fivefold significant bacteriuria in females compared to males and in Kalpana Devi Venkatesan et al¹ in 2015 showed females are more risk of developing ASB than males. Among 46 ASB patients, significant growth was found in 54.4% and 45.6% patients showed no growth. Shadma Yaqoob⁵ et al in 2018, Edward J. Boyko⁶ et al in 2004, Girishbabu R.J⁷ et al in 2013, Mainak Banerjee⁸ et al in 2019, and G.Ranjani⁹ et al in 2017 all these studies showed that E.coli was the prevalent organism. In this study also showed E.coli was the most prevalent etiological agents in ASB in type-2 diabetes. Klebsiella pneumoniae is the second most common organisms followed by enterococcus faecium. In our study E.coli were sensitive to nitrofurantoin (89.5%), meropenem (68.4%) and gentamycin (47.4%) Girishbabu R.J⁷ et al study showed E.coli was 100% sensitive to imipenem and 90% sensitive to nitrofurantoin. E.coli were least sensitive to ampicillin, ceftazidime, and tobramycin.

Conclusion

Among 80 diabetics patients the prevalence of asymptomatic bacteriuria was 57.5% in this study. Females are at more risk of developing asymptomatic bacteriuria than males. Among 46 asymptomatic patient significant growth was found in 25 (54.4%) and while 21(45.6%) patients showed no growth. Escherichia coli was the most prevalent organisms and sensitive to Nitrofurantoin 89.5%, meropenem 68.4% and gentamycin 47.4% and resistant to ampicillin

89.5%, ceftriaxone 73.7%, and ceftazidime 73.7% and resistant to ampicillin 89.5%, ceftriaxone 73.7% and ceftazidime 73.7%.

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