

## Original Article

### Assessment of asymptomatic bacteriuria and antibiotic sensitivity pattern among diabetic females: A pharmacological study

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#### ABSTRACT:

**Background:** The word Diabetes mellitus is derived from the Greek word Diabetes, which literally means siphon - to pass through. Asymptomatic bacteriuria (ABU) is the presence of bacteria in the properly collected urine of a patient that has no signs or symptoms of a urinary tract infection. Many studies have demonstrated the resistance of bacteria to various antibiotics results in conversion of ASB into symptomatic bacteriuria in UTI which leads to major complications among diabetic women. Hence; the present study was conducted for assessing asymptomatic bacteriuria and antibiotic sensitivity pattern among diabetic females. **Materials & methods:** A total of 100 diabetic females were analyzed. Subjects with presence of known type two DM with a history of minimum of past 5 years were enrolled. Mid-stream urine samples were collected and sent within one hour for processing. Microbiological profile was assessed. Antibiotic sensitivity pattern was also analyzed. **Results:** ABU was present in 21 percent of the patients. E. coli and K. pneumonia were found to be present in 52.38 percent and 23.80 percent of the patients with ABU. Coagulase negative staphylococci and Staphylococcus aureus were found to be present in 9.52 percent and 14.28 percent of the patients. E. coli was found to be sensitive mainly to Amikacin, Gentamicin, ciprofloxacin and Nalidixic acid while it was found to be resistant mainly to cephalotin and Vancomycin. Klebsiella pneumonia was found to be sensitive for Amikacin, Gentamicin, Ciprofloxacin and Cephalotin while it was found to be resistant mostly to Ceftriaxone, Nalidixic acid and Ampicillin. **Conclusion:** Based on the available antibiotic sensitivity patterns of the commonly isolated pathogens, appropriate empirical therapy for AUB can be instituted timely to reduce complications, such as pyelonephritis and other upper UTIs

**Key words:** Asymptomatic bacteriuria, Antibiotic sensitivity

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#### INTRODUCTION

The word Diabetes mellitus is derived from the Greek word Diabetes, which literally means siphon - to pass through. However; in Latin language, it means sweet. Metabolically, it is associated with significant elevation and derangement of blood glucose levels. In recent years, the prevalence of diabetes, as well as prediabetes, has significantly increased in India. DM is broadly classified into three types by etiology and clinical presentation, type 1 diabetes, type 2 diabetes, and gestational diabetes (GDM). Type 2 diabetes mellitus (T2DM) accounts for around 90% of all cases

of diabetes. In T2DM, the response to insulin is diminished, and this is defined as insulin resistance.<sup>1-3</sup>

Asymptomatic bacteriuria (ABU) is the presence of bacteria in the properly collected urine of a patient that has no signs or symptoms of a urinary tract infection. The etiology of asymptomatic bacteriuria has not been conclusively determined. ASB is more prevalent in women, due to a short urethra that is in proximity to the warm, moist, vulvar, and perianal areas that are colonized with enteric bacteria. Many studies have demonstrated the resistance of bacteria to various antibiotics results in conversion of ASB into

symptomatic bacteriuria in UTI which leads to major complications among diabetic women.<sup>4-6</sup> Hence; the present study was conducted for assessing asymptomatic bacteriuria and antibiotic sensitivity pattern among diabetic females.

### MATERIALS & METHODS

The present study was conducted for assessing asymptomatic bacteriuria and antibiotic sensitivity pattern among diabetic females. A total of 100 diabetic females were analyzed. Subjects with presence of known type two DM with a history of minimum of past 5 years were enrolled. Exclusion criteria:

- Patients with presence of any other systemic illness or any anatomical urogenital abnormality.
- Patients who had undergone any invasive urologic procedure.
- Patients who refused to give consent.
- Pregnant women.

Mid-stream urine samples were collected and sent within one hour for processing. Microbiological profile was assessed. Antibiotic sensitivity pattern was also analyzed. Final results were analyzed by SPSS software. Chi-square test, student t test and Mann Whitney U test were used for evaluation of level of significance.

### RESULTS

Mean age of the patients was 54.86 years. 34 percent of the patients belonged to the age group of 51 to 60 years. 24 percent of the patients belonged to the age group of 40 to 51 years. Mean HbA1c concentration and FBS concentration was 9.2% and 173.1 mg/dL respectively. ABU was present in 21 percent of the patients. E. coli and K. pneumonia were found to be present in 52.38 percent and 23.80 percent of the patients with ABU. Coagulase negative staphylococci and Staphylococcus aureus were found to be present in 9.52 percent and 14.28 percent of the patients. E. coli was found to be sensitive mainly to Amikacin, Gentamicin, ciprofloxacin and Nalidixic acid while it was found to be resistant mainly to cephalotin and Vancomycin. Klebsiella pneumonia was found to be sensitive for Amikacin, Gentamicin, Ciprofloxacin and Cephalotin while it was found to be resistant mostly to Ceftriaxone, Nalidixic acid and Ampicillin.

Table 1: Age-wise distribution of patients

Age group (years)	Number of patients	Percentage of patients
Less than 40	15	15
40 to 51	24	24
51 to 60	34	34
More than 60	27	27
Total	100	100
Mean age $\pm$ SD	54.86 $\pm$ 10.25	

Table 2: Glycaemia profile

Parameter	Mean	SD
HbA1c (%)	9.2	2.8
FBS (mg/dL)	173.1	24.7

Table 3: Prevalence of ABU

Parameter	Number of patients	Percentage
Asymptomatic bacteriuria	21	21
Total patients	100	100

Table 4: Microbiological profile

Microbiological profile	Number of patients	Percentage of patients
Escherichia coli	11	52.38
Klebsiella pneumonia	5	23.80
Coagulase negative staphylococci	2	9.52
Staphylococcus aureus	3	14.28
Total	21	100

Graph 1: Bar graph showing Microbiological profile of patients

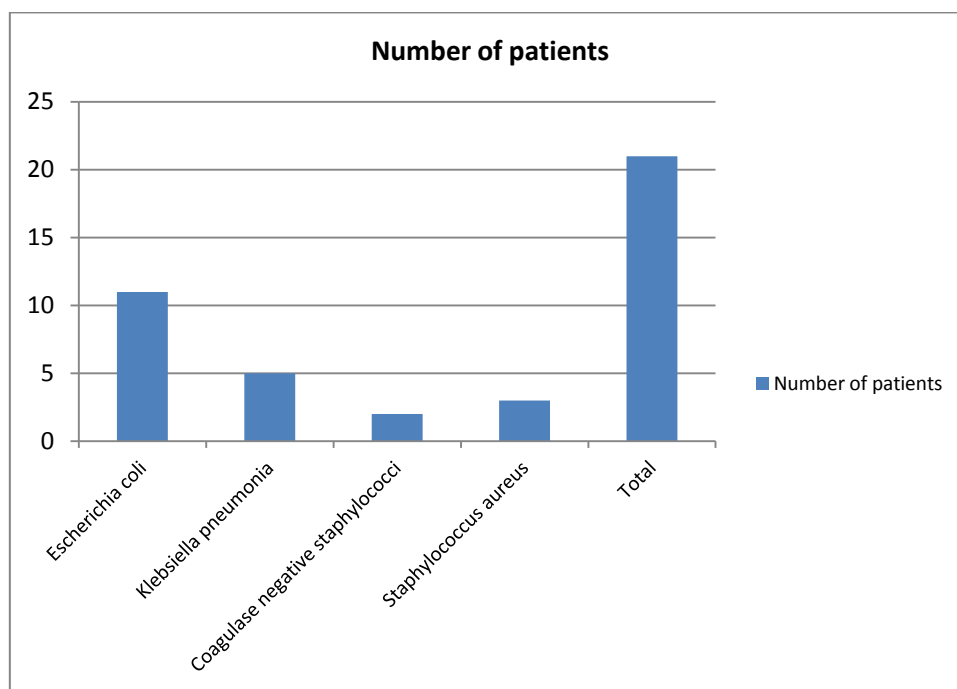


Table 5: Antibiotic sensitive pattern

Microbiological profile	Escherichia coli (n=11)		Klebsiella pneumonia (n=5)		Coagulase negative staphylococci (n=2)		Staphylococcus aureus (n=3)	
	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant	Sensitive	Resistant
Amikacin	7	4	4	1	2	0	3	0
Gentamicin	7	4	4	1	1	1	2	1
Ciprofloxacin	6	5	2	3	1	1	1	2
Cephalotin	1	10	2	3	1	1	-	-
Ceftriaxone	3	8	2	3	-	-	2	1
Nalidixic acid	5	6	2	3	-	-	-	-
Cotrimoxazole	4	7	-	-	1	1	-	-
Tobramycin	-	-	-	-	-	-	-	-
Clindamycin	-	-	-	-	1	1	-	-
Erythromycin	-	-	-	-	1	1	0	3
Vancomycin	2	9	-	-	2	0	3	0
Ampicillin	-	-	0	5	-	-	2	1

## DISCUSSION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. It is associated with decrease in production and utilization of insulin, resulting in body's inability to utilize nutrients properly. The worldwide prevalence of DM has risen dramatically over the past two decades, from an estimated 30 million cases in 1985 to 382 million in 2013. Based on the current trends, the International Diabetes Federation projected that 592 million individuals will have diabetes by the year 2035. The rising incidence of DM and the sheer number of people with DM living in India have given this country the dubious distinction of being the "Diabetes Capital" of the world.<sup>7-9</sup>

The reason for greater frequency of infections in DM patients include incompletely defined abnormalities in cell-mediated immunity and phagocyte function associated with hyperglycemia as well as diminished vascularization. Pneumonia, urinary tract infections (UTIs), and skin and soft tissue infections are all more common in the diabetic population. UTIs (either lower urinary tract or pyelonephritis) are the result of common bacterial agents such as *Escherichia coli*, although several yeast species (*Candida* and *Torulopsis glabrata*) are also commonly observed to cause UTI in diabetics. Bacteriuria occurs frequently in individuals with diabetic cystopathy. Poor glycemic control is a common factor in individuals with these infections.<sup>7-9</sup> Hence; the present study was conducted for assessing asymptomatic bacteriuria and antibiotic sensitivity pattern among diabetic females.

In the present study, mean age of the patients was 54.86 years. 34 percent of the patients belonged to the age group of 51 to 60 years. 24 percent of the patients belonged to the age group of 40 to 51 years. Mean HbA1c concentration and FBS concentration was 9.2% and 173.1 mg/dL respectively. ABU was present in 21 percent of the patients. *E. coli* and *K. pneumonia* were found to be present in 52.38 percent and 23.80 percent of the patients with ABU. In the study conducted by Reddy et al, the data revealed that the most of the isolated organisms are highly sensitive towards Amikacin, Nitrofurantoin, Meropenem, Vancomycin and Cefoperazone+sulbactam whereas decrease in sensitivity pattern has been noticed with other antibiotics like Ciprofloxacin, Ofloxacin, Gentamicin and Cefotaxime.<sup>12-16</sup>

In the present study, coagulase negative staphylococci and *Staphylococcus aureus* were found to be present in 9.52 percent and 14.28 percent of the patients. *E. coli* was found to be sensitive mainly to Amikacin, Gentamicin, ciprofloxacin and Nalidixic acid while it was found to be resistant mainly to cephalotin and Vancomycin. *Klebsiella pneumonia* was found to be sensitive for Amikacin, Gentamicin, Ciprofloxacin and Cephalotin while it was found to be resistant

mostly to Ceftriaxone, Nalidixic acid and Ampicillin. In a previous study, resistance to all Gram negative isolates was observed for amoxicillin (87%), piperacillin (74%) and cotrimoxazole (73%); meanwhile ofloxacin (88%) and imipenem (98%) were the most active antibiotics. Resistance to penicillins is associated with the production of beta lactamase. High resistance to cotrimoxazole may be due its frequent use in our study area to treat UTIs and other infectious diseases. In the present study, Gram negative bacteria showed high resistance to gentamicin (59.3%) compared to Gram positive cocci (11.8%). This difference in resistance may be due to the over-expression of efflux pumps in Gram negative bacteria. Nitrofurantoin resistance is usually uncommon; the moderate resistance observed in this study may be due to the development of cross-resistance. Gram negative bacteria showed moderate to high resistance to both the second and third generation cephalosporins. This is commensurate to previous reports in the study area as well as other developing countries. Resistance to ceftriaxone has been attributed to extended spectrum beta lactamases (ESBLs) production (Gangoue PJ et al, Li XZ et al, Bissong ME et al).<sup>17-19</sup> Findings from the current study suggest that the type-2 diabetic women with asymptomatic bacteriuria may have an increased risk of symptomatic urinary infection followed by other complications, which is also supported by our antibiotic sensitivity assay.

## CONCLUSION

Based on the available antibiotic sensitivity patterns of the commonly isolated pathogens, appropriate empirical therapy for AUB can be instituted timely to reduce complications, such as pyelonephritis and other upper UTIs. However; further studies are recommended.

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