

# Prevalence and Pathogens of Asymptomatic Bacteriuria in Diabetic Patients: A Gender - Based Study

Aysha Salim

Research Scholar, Srinivas University, Mangalore, Karnataka, India

Orcid - ID 0009 - 0000 - 8558 - 0718

Email: [aysh.salim\[at\]gmail.com](mailto:aysh.salim[at]gmail.com)

**Abstract:** *The worldwide prevalence of diabetes mellitus (DM) has risen dramatically over the past two decades. 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. People with diabetes are more prone to infections. Asymptomatic bacteriuria (ASB) is the presence of at least  $10^5$  colony forming units (CFU) per ml of one or more bacterial species in clean - voided midstream urine from a person who does not have any signs of a urinary tract infection (UTI). The goal of this research was to determine the prevalence of ASB in patients with DM according to sex and to study the spectrum of uropathogens causing ASB. This study was conducted on diabetic patients (50 males and 50 females). This research concluded that among the 100 diabetic patients, 28 of them have asymptomatic bacteriuria. Out of the 28 positive ASB cases, 19 of them were females and 9 of them were males. E. coli was the most common pathogen isolated from urine sample of diabetic patients causing ASB.*

**Keywords:** Diabetes mellitus (DM), asymptomatic bacteriuria (ASB), glucose, urine, E. coli

## 1. Introduction

India had 32 million diabetic patients in the year 2000 and this number would increase to 80 million by the year 2030.<sup>1</sup> Diabetes mellitus (DM) is a condition that affects multiple organ systems. A defect in the production or utilization of insulin, a hormone that helps to regulate blood sugar levels by transporting glucose to different tissues for uptake when the glucose levels in the blood reach above a standard level of concentration, is what makes it chronic, and as a result it is associated with countless complications.<sup>2</sup> <sup>3</sup>The scientific community is aware that people with diabetes are more prone to infections. According to studies, diabetics are four times more likely than non - diabetics to get an illness.<sup>4</sup>

Among infections in diabetics, urinary tract infections (UTIs) are the most common type of infection.<sup>5</sup> Diabetic patients are traditionally thought to have a clinically important concern with urinary tract infections (UTIs).<sup>6</sup> The worldwide health problem of diabetes mellitus has increased. The genitourinary system is negatively impacted by diabetes mellitus in a number of long - term ways. This impact makes people more susceptible to bacterial UTIs.<sup>7</sup>

Patients with Type 2 diabetes who have asymptomatic bacteriuria (ASB) are more likely to get a symptomatic UTI later on. Asymptomatic bacteriuria that is left untreated puts the person at risk for recurrent UTI, which can lead to kidney illness (pyelonephritis and gram - negative septicaemia). One of the most significant causes of morbidity for diabetes people is UTI.<sup>8</sup> Asymptomatic bacteriuria (ASB) is the presence of at least  $10^5$  colony forming units (CFU) per ml of one or more bacterial species in clean - voided midstream urine from a person who does not have any signs of a urinary tract infection (UTI), such as

dysuria, frequency, urgency, strangulation, abdominal distention, or fever.

Renal impairment and related urinary tract infections (UTI) rank as one of the most serious long - term type 2 diabetes mellitus consequences. High glucose levels in the urine encourage the colonization of the urinary system by bacteria, which increases the risk of kidney microvascular disease in the patient. This has also grown to be a significant issue because several studies have noted a high rate of UTI in type 2 diabetes mellitus patients.<sup>9</sup>

The aim of this study was to determine the prevalence of asymptomatic bacteriuria (ASB) in patients with diabetes mellitus based on sex and to study the spectrum of uropathogens causing asymptomatic bacteriuria in diabetic patients.

## 2. Materials and Methods

The study was conducted on 100 patients (50 males and 50 females) with diabetes mellitus. Data regarding age, gender, family history of diabetes, duration of diabetes, medical history, current medications and complications of diabetes, previous antimicrobial use (within three months) or UTI within the last twelve months and a history of recurrent UTIs were recorded.

The study excluded patients with symptomatic UTIs, renal failure, obstructive uropathy, indwelling catheters, pregnant females, immuno - compromised patients, and patients who had received antimicrobial drugs during the previous 2 weeks.

All study participants were consulted for proper urine specimen collection in order to avoid contamination, and a clean urine specimen was collected in appropriate

sterilecontainers from all patients. Urine analysis was carried out according to standard procedures. Urine wet mount and gram stain examination was done for all urine specimens to detect the presence of pus cells and bacteria in urine. Urine cultures were performed in positive cases by inoculation into blood agar, Mac Conkey agar and CLED (Cysteine Lysine Electrolyte Deficient agar) plates and incubated at 37 degrees Celsius for 16 to 18 hours. Bacterial species were identified by the use of standard biochemical methods.

For diagnosing ASB in females, two consecutive specimens with isolation of the same species in quantitative counts of at least 100, 000 colony forming units (CFUs) /mL of urine were considered, whereas in males, a single specimen with one bacterial species isolated in a quantitative count of at least 100, 000 CFUs/mL was considered. The data were analysed to determine the association between diabetes and ASB.

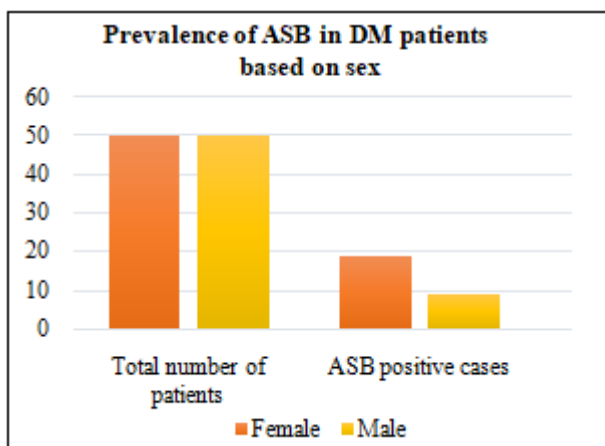
### 3. Observations and Results

- Among the 100 diabetic patients included in the study, 28 of them were positive for asymptomatic bacteriuria (ASB).
- Cases of asymptomatic bacteriuria varied according to the sex of patients. ASB was more common in females, with 19 out of 50 females with diabetes mellitus were positive for ASB and 9 out of 50 males were positive for ASB.
- The most common microorganisms isolated from ASBpositive patients was E. coli, accounting for 15 out of 28 cases (53.58%), followed by Klebsiella pneumoniae in 8 cases (28.57%), Pseudomonas aeruginosa in 3cases (10.71%) and Staphylococcus aureus in 2 cases (7.14%).

#### Prevalence of ASB In Patients with Diabetes Mellitus Based on Sex

**Table 1:** Showing prevalence of ASB in patients with diabetes mellitus according to sex

	Female	Male
Total no: of patients	50	50
ASB positive cases	19	09
Prevalence of ASB in %	68	32

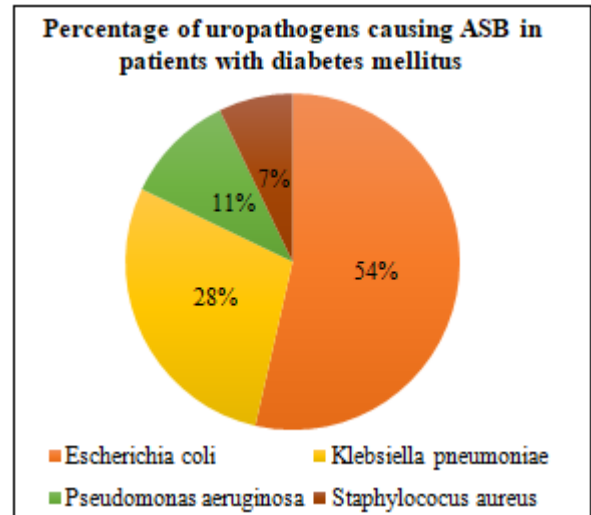


**Figure 1:** Bar diagram showing prevalence of ASB in patients with diabetes mellitus (DM) based on sex.

#### Distribution of Uropathogens in ASB Positive Patients with Diabetes Mellitus

**Table 2:** Showing distribution of uropathogens in ASB positive patients with diabetes mellitus.

Pathogens isolated	Number of pathogens isolated	Percentage of pathogens
Escherichia coli	15	53.58%
Klebsiella species	08	28.57%
Pseudomonas aeruginosa	03	10.71%
Staphylococcus aureus	02	7.14%



**Figure 2:** Pie chart showing percentage of uropathogens causing ASB in DM patients.

Among the 28 ASB positive diabetic patients, E. coli was isolated from 15diabetic patients, Klebsiella pneumoniaewas isolated from 8 patients, Pseudomonas aeruginosa from 3 patients and Staphylococcus aureus from 2 diabetic patients.

### 4. Discussion

Diabetes mellitus (DM) is a metabolic condition characterized by excessive hyperglycemia and impaired insulin secretion, or by both insulin resistance and insufficient insulin production to counteract it. It is becoming more common knowledge that urinary tract infections and diabetes mellitus are related. Among diabetes patients, asymptomatic bacteriuria is typical and, if untreated, may result in disastrous effects. Diabetes individuals who have UTIs are more likely to develop potentially fatal consequences such as renal papillary necrosis and emphysematous pyelonephritis.

In the present study, among the 100 diabetic patients (50 females and 50 males), 28of them had asymptomatic bacteriuria (ASB) of which 19 of them were females and 9 were males.

Another similar research by Aman Bharti et al. on type 2 diabetes mellitus patients revealed that asymptomatic bacteriuria (ASB) was widespread in diabetes patients as seen by the prevalence of 21% ASB was more prevalent in females with 15 (71%) out of the total of 21 ASB positive patients. The prevalent microorganisms in this studywere E. coli (53.58%), Klebsiella species (32.14%), Pseudomonas

aeruginosa (7.14%) and Staphylococcus aureus (7.14%). In a study by Marie E A Bissong et. al, prevalent microorganisms in diabetes mellitus patients were coagulase negative Staphylococcus (36.3%), Klebsiella species (15.9%), Candida species (13.7%), E. coli and Serratia species (10.8%) each.

Another study conducted by Bonadio *et al* on 228 diabetic women found that prevalence of ASB was 17.5% and the presence of higher HbA1c levels was a significant risk factor for ASB in women with type 2 DM. Ajay Adhikaree *et al.* in their study included 116 diabetic adults and observed that overall prevalence of ASB was 10.3% and patients with poor glycemic control had higher prevalence of ASB in comparison to those with good glycemic control.

## 5. Conclusion

Poor glycemic control is a key risk factor for the development of ASB, which is frequent in people with type 2 diabetes. In order to avoid ASB, proper glycemic management is crucial. In the present study, asymptomatic bacteriuria was more prevalent in females than males and E. coli was the most common organism causing asymptomatic bacteriuria in patients with diabetes mellitus. Careful monitoring of glycemic status, regular screening for ASB in diabetics, and judicious use of antibiotics by primary care physicians can help to resolve ASB - related complications in diabetics.

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