The Arab University Journal of Sciences and Technology
Volume (1) Issue (1) November, 2025

A Cross-Sectional Study of Asymptomatic Bacteriuria in Diabetic Patients in Benghazi City, Libya

Maged Y. Adam
Head, Department of Medical Laboratory Sciences, Al- Arab University For Medical and Technological Sciences
Corresponding Author: magedhamed@armu.edu.ly

Received: 01/09/2025, Accepted: 25/10/2025

Abstract: *Diabetes mellitus (DM) is a metabolic condition characterized by hyperglycemia due to problems with insulin secretion, action, or both. Asymptomatic bacteriuria (ASB) denotes the presence of bacteria in the urine without the typical signs or symptoms of a urinary tract infection (UTI). This study aimed to determine the Prevalence of Asymptomatic Bacteriuria in Diabetic Patients in Benghazi City, Libya and the patterns of antimicrobial susceptibility, 2025. This Cross-Sectional study was conducted among the diabetic patients presenting to Arab Medical Laboratory. Patients with symptoms of UTI, pregnancy, recent history of hospitalization, use of antimicrobial in last 14 days. Total 100 Mid-stream urine samples were collected from consented subjects. Urine samples were processed and examined for the various pathogens using the standard microbiological procedures. All data were collected and was analyzed statistically using SPSS v20. The study population consisted of 100 diabetic patients, predominantly males (65%), with females representing (35%). The highest age group was 61–70 years (42%), followed by 51–60 years (35%). These findings align with prior research showing that ASB prevalence increases with age due to declining immune function and chronic hyperglycemia. Insulin therapy was used by 30%, while 70% were on oral hypoglycemic medications. E. coli was the predominant uropathogen (28%), followed by Klebsiella (8%), Pseudomonas (2%), and Staphylococcus (2%). Drugs such as gentamicin, ciprofloxacin, and amoxicillin may be considered effective against E. coli, which remains the predominant pathogen. The mean HbA1c level among diabetic patients with asymptomatic bacteriuria was 11.10 ± 2.78%, indicating poor overall glycemic control within the study population.*

Keywords:**Prevalence, Diabetes mellitus, Asymptomatic bacteriuria, CLED Agar, Antibiotic susceptibility, EDTA.**

INTRODUCTION

Diabetes mellitus (DM) is a metabolic condition characterized by hyperglycemia due to problems with insulin secretion, action, or both (1). Asymptomatic bacteriuria (ASB) denotes the presence of bacteria in the urine without the typical signs or symptoms of a urinary tract infection (UTI)(2). The diagnosis of ASB is confirmed through urine culture obtained from a properly collected midstream sample, following established clinical protocols. Escherichia coli (*E.coli*) is the most frequently identified organism in urine cultures from both diabetic and non-diabetic individuals. Nonetheless, those with diabetes tend to show a greater prevalence of unusual uropathogens and a higher antibiotic resistance (3). Due to the increased risk of upper urinary tract involvement and the possibility of ASB progressing to symptomatic UTI in diabetic patients, urine cultures are often recommended both before and after treatment in specific high-risk scenarios. The range of urinary tract infections (UTIs) in individuals with DM includes ASB, cystitis, pyelonephritis, and severe urosepsis; diabetic patients are more susceptible to serious complications compared to the general population, including conditions such as emphysematous cystitis, pyelonephritis, renal abscesses, and renal papillary necrosis (4). Diabetic individuals exhibit over a 27% higher prevalence of ASB than those without diabetes (5). The microbial agents and patterns of antimicrobial susceptibility for ASB pathogens can vary significantly by region, influenced by factors such as genetic diversity, socioeconomic conditions, hygiene practices, geographic factors, and ethnicity (6). Previous studies indicate that women with diabetes are approximately three times more likely to experience ASB than their non-diabetic counterparts (7). Both diabetic men and women have a higher risk of hospitalization due to complications related to ASB, such as acute pyelonephritis, compared to non-diabetic individuals. Research indicates that around 3.4% to 17% of diabetic men are affected by acute pyelonephritis, while diabetic women are 6 to 24 times more prone to this condition than their non-diabetic peers. In addition to the increased likelihood of developing pyelonephritis, diabetic patients are also more susceptible to severe complications, which may include renal and perinephric abscesses, emphysematous pyelonephritis, renal papillary necrosis, bacteremia, and urosepsis. Furthermore, diabetic patients with ASB have a heightened risk of developing pyelonephritis and experiencing albuminuria (8).

Materials and Methods:

Study Area:

This Cross-Sectional study was conducted among the diabetic patients in Benghazi City, Libya. To evaluate the prevalence of asymptomatic bacteriuria (ASB) and the patterns of antimicrobial susceptibility from Jun 1,2025 to August 30, 2025.

Study Population:

Samples were obtained from Patients who presented to Arab Medical Laboratory.

Exclusion Criteria:

Patients with symptoms of UTI, pregnancy, recent history of hospitalization, use of antimicrobial in last 14 days or UTI in recent past were excluded.

Data Collection:

All pertinent information was collected using ethically approved questionnaires.

Specimen Collection:

Mid-stream urine samples were collected in a sterile, wide-mouthed, screw-capped container to minimize contamination risk. They were advised to clean the genital area before collection and to avoid contact with the interior or lid of the container.

Blood samples were collected in EDTA tubes, and an HbA1c test was performed to assess glycemic control.

Isolation and Inoculation:

Each urine sample was assessed for color, volume, turbidity, cloudiness, and odor. A colony count of 10^5 CFU/ml was considered significant for diagnosing asymptomatic bacteriuria. Using a sterile calibrated wire loop (0.001 ml), urine specimens were inoculated onto CLED agar. After incubation for 24 hours at 36°C, culture plates were examined for bacterial growth and cultural characteristics. Counts below 10^5 CFU/ml were regarded as insignificant. Identification of bacterial isolates was performed through gram reaction, biochemical testing, and colony morphology analysis.

Antimicrobial Susceptibility Tests:

Antimicrobial susceptibility was evaluated using the Kirby-Bauer disk diffusion method on Mueller-Hinton agar, following Clinical and Laboratory Standards Institute (CLSI) guidelines. Commercially available antibiotic discs were utilized for testing. To create the bacterial inoculum, isolated colonies were transferred to a sterile tube containing physiological saline and mixed to form a homogenous suspension. The turbidity was adjusted to the 0.5 McFarland standard to ensure consistent bacterial concentration. A sterile cotton swab was dipped into the adjusted suspension, and excess fluid was removed. The swab was used to evenly distribute the bacterial suspension across the Mueller-Hinton agar plate in three directions. The inoculated plates were left at room temperature for approximately 30 minutes to allow the bacterial suspension to absorb into the media. Following this, antibiotic discs were placed on the agar surface using sterile forceps. The plates were then incubated at 37°C for 18 to 24 hours. After incubation, the zones of inhibition around each disc were measured in millimeters using a ruler. Results were classified as sensitive, intermediate, or resistant in accordance with the CLSI standard zone diameter interpretive chart(9).

Statistical Analysis

Data collected from questionnaires and laboratory results were entered and analyzed using IBM SPSS Statistics software, version 20. Descriptive statistics summarized demographic characteristics, clinical data, and the prevalence of ASB among diabetic patients, expressed in frequencies, percentages, means, and standard deviations as appropriate. The Chi-square test (χ^2) was employed to examine associations between categorical variables, including the presence of ASB and factors such as age, gender, type of diabetes, smoker, and glycemic control. A p-value of less than 0.05 was considered statistically significant (11).

Results:

The table shows a total of 100 diabetic patients with asymptomatic bacteriuria. Among them, the majority was male (65%), while females accounted for 35% of the study population. With respect to age distribution, most patients were in the 61–70 years group (42%), followed by 51–60 years (35%), while smaller proportions were observed in the 41–50 years group (12%) and 30–40 years group (8%). Only 3% of patients were in the 71–80 years category. This indicates that asymptomatic bacteriuria was more frequent in older age groups, particularly those above 50 years. Regarding lifestyle factors, smokers and non-smokers were equally represented (50% each). In terms of diabetes management, 30% of patients were using insulin therapy, whereas 70% were not using insulin. On the other hand, oral hypoglycemic medications were used by 70% of patients, while 30% were not on oral therapy. Concerning comorbidities, a significant proportion of patients had hypertension (75%), while only 25% were normotensive. Kidney disease was present in 3% of the patients, whereas the majority (97%) did not report kidney disease. Overall, the findings highlight that older age, male gender, hypertension, and smoking were common characteristics among diabetic patients with asymptomatic bacteriuria. The table presents the antibiotic susceptibility of positive cultures. E. coli isolates were fully sensitive to amoxicillin, gentamicin, ciprofloxacin, amikacin, and meropenem ($p = 0.001$). Klebsiella was resistant to all tested antibiotics. Pseudomonas was sensitive only to gentamicin, and Staphylococcus was sensitive only to amoxicillin. Ampicillin resistance was universal across all organisms, preventing meaningful statistical analysis. These results highlight that E. coli remains largely treatable, whereas other pathogens, particularly Klebsiella, present treatment challenges due to multidrug resistance. The table able presents the multivariable logistic regression analysis of potential risk factors for asymptomatic bacteriuria. Variables including age, smoking, HbA1c, insulin use, oral medication, hypertension, kidney disease, and organism type did not reach statistical significance. Some regression coefficients, particularly for organism type, were extremely large with very wide standard errors, indicating model instability likely caused by small sample sizes and sparse data in certain categories. None were statistically significant predictors of bacteriuria (all $p > 0.05$). The table shows logistic regression restricted to culture-positive patients. Among 40 patients with positive urine cultures, organism type and antibiotic susceptibility were not significant predictors of outcomes. For patients with positive cultures, regression analysis of different antibiotics and organisms showed no significant association (all $p > 0.05$). The wide confidence intervals suggest unstable estimates, possibly due to the small number of positive isolates.

Table 1: Socio-demographic variables among asymptomatic bacteriuria in diabetic patients.

Variable {n=100}	*Number (n)*	*Percent (%)*
Gender		
Male	65	65.0%
Female	35	35.0%
Age Group {Yrs}		
30 - 40	8	8.0%
41 - 50	12	12.0%
51 - 60	35	35.0%
61 - 70	42	42.0%
71 - 80	3	3.0%
Smoking		
Smoker	50	50.0%
Non smoker	50	50.0%
Using Insulin		
Using	30	30.0%
Non using	70	70.0%
Oral Medication		
Using	70	70.0%
Non using	30	30.0%
Hypertension		
Yes	75	75.0%
No	25	25.0%
Kidney Disease		
Yes	3	3.0%
No	97	97.0%

The table shows a total of 100 diabetic patients with asymptomatic bacteriuria. Among them, the majority was male (65%), while females accounted for 35% of the study population. With respect to age distribution, most patients were in the 61–70 years group (42%), followed by 51–60 years (35%), while smaller proportions were observed in the 41–50 years group (12%) and 30–40 years group (8%). Only 3% of patients were in the 71–80 years category. This indicates that asymptomatic bacteriuria was more frequent in older age groups, particularly those above 50 years. Regarding lifestyle factors, smokers and non-smokers were equally represented (50% each). In terms of diabetes management, 30% of patients were using insulin therapy, whereas 70% were not using insulin. On the other hand, oral hypoglycemic medications were used by 70% of patients, while 30% were not on oral therapy. Concerning comorbidities, a significant proportion of patients had hypertension (75%), while only 25% were normotensive. Kidney disease was present in 3% of the patients, whereas the majority (97%) did not report kidney disease. Overall, the findings highlight that older age, male gender, hypertension, and smoking were common characteristics among diabetic patients with asymptomatic bacteriuria.

Table 2: Correlation between isolated organism and antibiotic susceptibility among asymptomatic bacteriuria in diabetic.

Antibiotic Susceptibility			**Isolated Organism**				**P-value**
Positive culture Patterns {n=40}			E.coli	Klebsiell a	Pseudomonas	Staphylococcus	
	Resistant	N	0	8	2	0	
Amoxicillin		%	0.0%	20.0%	5.0%	0.0%	0.001
	Sensitive	N	28	0	0	2	
		%	70.0%	0.0%	0.0%	5.0%	
	Resistant	N	28	8	2	2	Can not
		%	70.0%	20.0%	5.0%	5.0%	calculated
Ampicillin	Sensitive	N	0	0	0	0	Due to
		%	0.0%	0.0%	0.0%	0.0%	constant variable
	Resistant	N	0	8	0	2	
		%	0.0%	20.0%	0.0%	5.0%	0.001
Gentamicin	Sensitive	N	28	0	2	0	
		%	70.0%	0.0%	5.0%	0.0%	
	Resistant	N	0	8	2	2	
		%	0.0%	20.0%	5.0%	5.0%	0.001
Ciprofloxacin	Sensitive	N	28	0	0	0	
		%	70.0%	0.0%	0.0%	0.0%	
	Resistant	N	0	0	0	0	Can not
		%	0.0%	0.0%	0.0%	0.0%	calculated
Amikacin	Sensitive	N	28	8	2	2	Due to
		%	70.0	20.0%	5.0%	5.0%	constant variable
	Resistant	N	0	0	0	0	Can not
		%	0.0%	0.0%	0.0%	0.0%	calculated
Meropenem	Sensitive	N	28	8	2	2	Due to
		%	70.0%	20.0%	5.0%	5.0%	constant variable

The table presents the antibiotic susceptibility of positive cultures. E. coli isolates were fully sensitive to amoxicillin, gentamicin, ciprofloxacin, amikacin, and meropenem (p = 0.001). Klebsiella was resistant to all tested antibiotics. Pseudomonas was sensitive only to gentamicin, and Staphylococcus was sensitive only to amoxicillin. Ampicillin resistance was universal across all organisms, preventing meaningful statistical analysis. These results highlight that E. coli remains largely treatable, whereas other pathogens, particularly Klebsiella, present treatment challenges due to multidrug resistance.

Table 3: Logistic regression analysis of variable factor of asymptomatic bacteriuria in diabetic patients

Variable {n=100}	B	S.E.	Wald	df	Sig.	Exp(B)
			Variables in the Equation			
Age Group			5.324	4	.256	
30 – 40 Yrs	1.595	1.556	1.050	1	.305	4.927
41 – 50 Yrs	-.351	1.516	.054	1	.817	.704
51 – 60 Yrs	-.374	1.397	.072	1	.789	.688
61 – 70 Yrs	.380	1.355	.079	1	.779	1.463
Smoking (Non smoker)	.361	.519	.484	1	.487	1.435
HBA1C	-.088	.082	1.130	1	.288	.916
Using Insulin (Non using)	.460	.514	.802	1	.371	1.584
Oral Medication (Non using)	.998	.579	2.968	1	.085	2.713
Hypertension (No)	-.528	.598	.779	1	.377	.590
Kedneydisease (No)	-1.727	1.583	1.191	1	.275	.178
No Growth			2.530	4	.639	
E.coli	19.286	28406.614	.000	1	.999	237591166.800
Klebsiella	20.124	28406.614	.000	1	.999	548959347.700
Pseudomonas	19.419	28406.614	.000	1	.999	271485380.900
Staphylococcus	-.414	40181.645	.000	1	1.000	.661
Constant	-19.924	28406.614	.000	1	.999	.000

The table able presents the multivariable logistic regression analysis of potential risk factors for asymptomatic bacteriuria. Variables including age, smoking, HbA1c, insulin use, oral medication, hypertension, kidney disease, and organism type did not reach statistical significance. Some regression coefficients, particularly for organism type, were extremely large with very wide standard errors, indicating model instability likely caused by small sample sizes and sparse data in certain categories. None were statistically significant predictors of bacteriuria (all p > 0.05).

Table 4: Logistic regression analysis of factor of asymptomatic bacteriuria in diabetic patients among positive culture of growth pattern

Positive culture patterns {n=40}	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval Lower Bound	Upper Bound
			Parameter Estimates				
[Ecoli = 1]	-59.035	114.741	.265	1	.607	-283.923	165.854
[Klebsiella = 2]	-42.359	104.490	.164	1	.685	-247.156	162.438
[Pseudomonas = 3]	-28.517	99.515	.082	1	.774	-223.563	166.529
Ampicillin	0[a]	.	.	0	.	.	.
Amoxicillin	31.752	98.349	.104	1	.747	-161.007	224.512
Gentamicin	15.157	31.322	.234	1	.628	-46.232	76.546
Ciprofloxacin	-65.721	119.656	.302	1	.583	-300.242	168.800
Amikacin	0[a]	.	.	0	.	.	.
Meropenem	0[a]	.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.

The table shows logistic regression restricted to culture-positive patients. Among 40 patients with positive urine cultures, organism type and antibiotic susceptibility were not significant predictors of outcomes. For patients with positive cultures, regression analysis of different antibiotics and organisms showed no significant association (all p > 0.05). The wide confidence intervals suggest unstable estimates, possibly due to the small number of positive isolates.

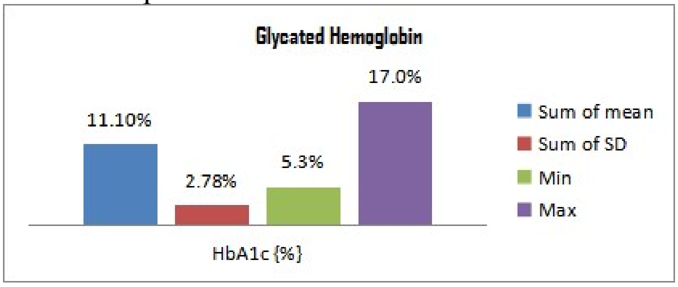

Figure 1: Descriptive statistics among asymptomatic bacteriuria in diabetic patients.

The figure shows the mean HbA1c level among diabetic patients with asymptomatic bacteriuria was 11.10 ± 2.78%, indicating poor overall glycemic control within the study population. The minimum HbA1c recorded was 5.3%, while the maximum reached 17.0%. The relatively high standard deviation reflects considerable variability in glycemic control among the patients. And statistically HbA1c yielded significant difference (P-value=0.001)This suggests that a substantial proportion of patients had HbA1c values well above the recommended target range for diabetes management, highlighting inadequate glucose regulation as a potential contributing factor to the occurrence of asymptomatic bacteriuria.

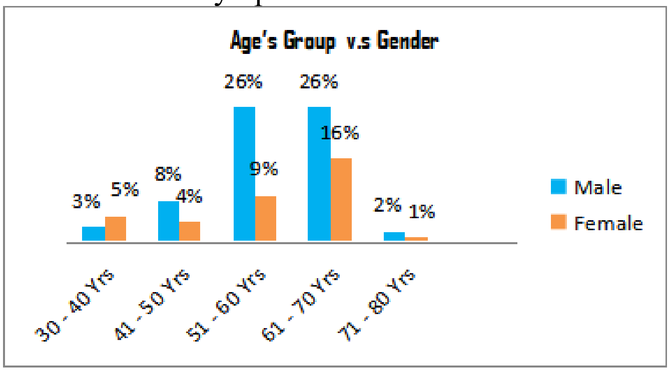

Figure 2: Distribution of asymptomatic bacteriuria in diabetic patients by genders according to age's group

The figure shows the association between isolated organism and gender. Among males, 41% had no growth, 15% had E. coli, 5% had Klebsiella, 2% had Pseudomonas, and 2% had Staphylococcus. Among females, 19% had no growth, 13% had E.

coli, 3% had Klebsiella, and none had Pseudomonas or Staphylococcus. The p-value was 0.396, indicating no significant association between gender and type of pathogen.

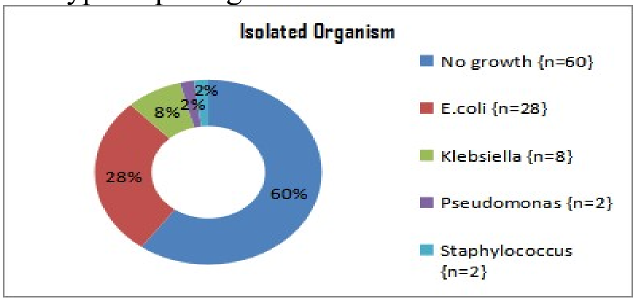

Figure 3: Frequency of asymptomatic bacteriuria in diabetic patients by isolated organism

The figure shows the frequency of isolated organisms. Sixty percent of urine cultures demonstrated no growth, while 40% were positive for bacterial growth. Among positive cultures, Escherichia coli was the most common isolate (28%), followed by Klebsiella (8%), Pseudomonas (2%), and Staphylococcus (2%).

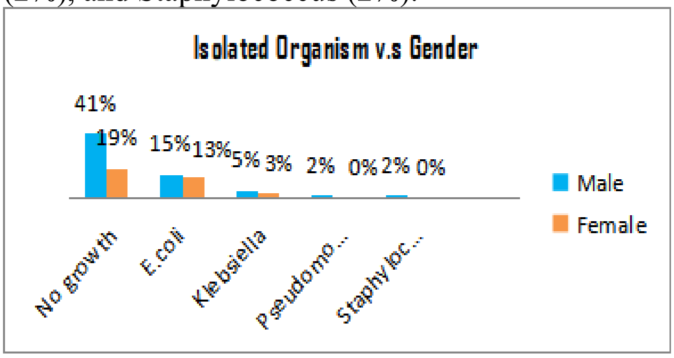

Figure 4: Association of isolated organism and gender among asymptomatic bacteriuria in diabetic patients

The figure presents the association between isolated organism and gender. Among males, 41% had no growth, 15% had E. coli, 5% had Klebsiella, 2% had Pseudomonas, and 2% had Staphylococcus. Among females, 19% had no growth, 13% had E. coli, 3% had Klebsiella, and none had Pseudomonas or Staphylococcus. The p-value was 0.396, indicating no significant association between gender and type of pathogen.

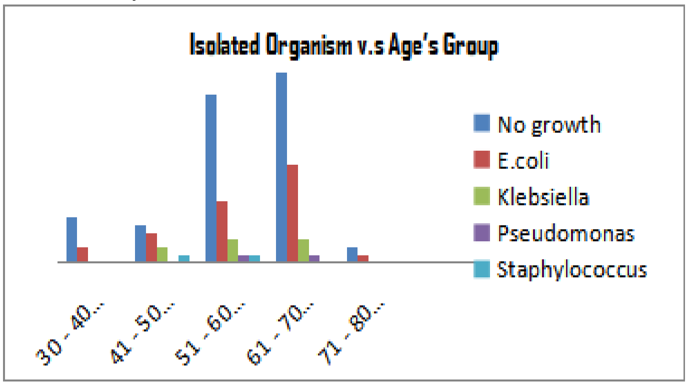

Figure 5: Association of isolated organism and age's group among asymptomatic bacteriuria in diabetic patients

The figure the association between isolated organism and age group. In the 30–40 years group, 6 patients had no growth and 2 had E. coli. In the 41–50 years group, 5 had no growth, 4 had E. coli, 2 had Klebsiella, and 1 had Staphylococcus. In the 51–60 years group, 22 had no growth, 8 had E. coli, 3 had Klebsiella, 1 had Pseudomonas, and 1 had Staphylococcus. In the 61–70 years group, 25 had no growth, 13 had E. coli, 3 had Klebsiella, 1 had Pseudomonas, and none had Staphylococcus. In the 71–80 years group, 2 had no growth and 1 had E. coli. The p-value was 0.950, showing no statistically significant association between age group and type of isolated organism.

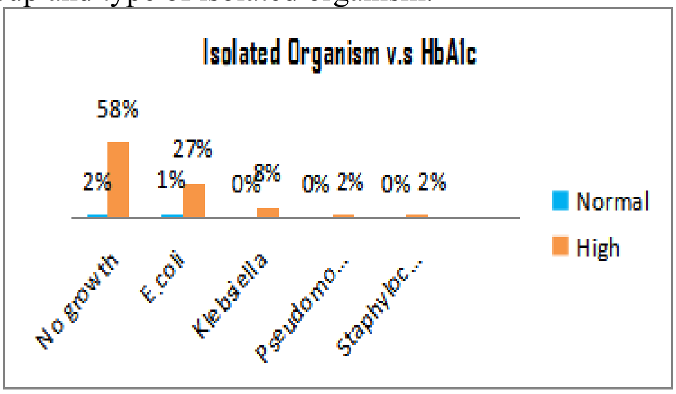

Figure 6: Association between glycated hemoglobin and isolated organism among asymptomatic bacteriuria in diabetic patients

Figure shows the correlation between isolated organism and HbA1c. Most patients had high HbA1c, reflecting poor glycemic control. No significant association was found between HbA1c and organism type ($p = 0.980$), possibly due to the limited variability in HbA1c values across the cohort.

Discussion:

This was a cross-sectional study of asymptomatic bacteriuria in diabetic patients in Benghazi City, Libya. The study population consisted of 100 diabetic patients, predominantly males (65%), with females representing 35%. The highest age group was 61–70 years (42%), followed by 51–60 years (35%). These findings align with prior research showing that ASB prevalence increases with age due to declining immune function and chronic hyperglycemia (13,14). While females typically have higher susceptibility to urinary tract infections due to anatomical differences, our results suggest that male diabetics, especially older males, also show high ASB prevalence, which agrees with findings by Nicolle et al. and Aamir et al.[15,16] showed that most patients had a long duration of diabetes, consistent with literature indicating that chronic hyperglycemia over years predisposes to bacterial colonizatio .(17).

Smoking was evenly distributed (50%) among participants, highlighting that smoking may not have significantly affected ASB prevalence in this cohort, although previous studies note immunosuppressive effects of tobacco contributing to urinary infections (18). Insulin therapy was used by 30%, while 70% were on oral hypoglycemic medications. Previous studies show that poor glycemic control, regardless of treatment modality, is a major contributor to ASB development (19,20). Hypertension was highly prevalent (75%), which correlates with prior studies demonstrating that vascular dysfunction and reduced renal perfusion in hypertensive diabetic patients can increase bacterial colonization (21,22). Kidney disease was rare (3%), aligning with studies where chronic kidney disease is less common but can exacerbate infection susceptibility when presen (23).

E. coli was the predominant uropathogen (28%), followed by Klebsiella (8%), Pseudomonas (2%), and Staphylococcus (2%) (Table 10). This distribution mirrors global data showing E. coli as the principal cause of ASB in diabetics due to its virulence factors and affinity for urinary epitheliu (24,25). No statistically significant association was found between organism type and gender (p=0.396) or age (p=0.950) (Tables 11–12), similar to findings by Aamir et al.[16] and Papazafiropoulou et al (26). indicating that demographic factors may not strongly influence microbial species in ASB among diabetics. The antibiotic resistance analysis revealed that E. coli isolates were highly sensitive to amoxicillin, gentamicin, and ciprofloxacin, while Klebsiella displayed notable resistance (Tables 13–18). Pseudomonas and Staphylococcus showed variable sensitivity. These findings align with reports from Abu-Humaidan et al. and Gupta et al., emphasizing that multidrug-resistant uropathogens are increasingly common in diabetic populations, necessitating culture-guided therapy to avoid treatment failure (27,28) .The observed patterns also underscore the importance of local antibiograms for empirical treatment, as resistance varies by region and institution (29). High HbA1c levels were observed in most patients with positive cultures, highlighting poor glycemic control as a central risk factor for ASB. This aligns with studies by Dai et al. and Nigussie et al., which found a strong correlation between hyperglycemia and bacterial colonization of the urinary tract (30). Mechanistically, glycosuria provides a nutrient-rich environment that facilitates bacterial growth, while impaired neutrophil function in hyperglycemic patients reduces immune clearance (31). The logistic regression analysis revealed no statistically significant predictors among variables such as age, gender, HbA1c, hypertension, insulin use, or oral medications. This contrasts with other studies where female sex, poor glycemic control, and hypertension were independent predictors of ASB (32,33,34). The lack of statistical significance may reflect the relatively small sample size or cohort-specific characteristics. Nevertheless, the trends observed still highlight the clinical relevance of these risk factors. Eventually this study highlights, asymptomatic bacteriuria in diabetic patients was more prevalent in older males with hypertension. E. coli was the predominant pathogen and generally sensitive to multiple antibiotics, whereas other organisms, particularly Klebsiella, demonstrated high resistance. No significant associations were identified between demographics, comorbidities, glycemic control, and the type of urinary pathogen, likely due to limited sample size and low variability in certain variables.

Conclusion:

This study demonstrated that asymptomatic bacteriuria is a frequent finding among diabetic patients, with *E. coli* being the most commonly isolated organism, followed by *Klebsiella*, *Pseudomonas*, and *Staphylococcus*. Despite the high prevalence of poor glycemic control and hypertension in the studied population, statistical analysis revealed no significant associations between bacteriuria and age, gender, HbA1c, or other clinical variables, as reflected by p-values greater than 0.05. On the other hand, antibiotic susceptibility testing demonstrated highly significant results ($p = 0.001$) for amoxicillin, gentamicin, and ciprofloxacin, where E. coli was fully sensitive while Klebsiella and Pseudomonas were resistant, indicating real differences in resistance profiles. For antibiotics such as ampicillin, amikacin, and meropenem, results were constant across isolates and p-values could not be calculated, reflecting uniform sensitivity or resistance. These findings suggest that demographic and metabolic factors are not reliable predictors of bacteriuria, while resistance patterns vary significantly among organisms. Therefore, culture and sensitivity testing remain essential for guiding therapy in diabetic patients to ensure effective treatment and reduce the risk of antimicrobial resistance. Logistic regression analysis failed to identify independent predictors of bacteriuria, most likely due to the small number of positive isolates. These findings emphasize the importance of continuous surveillance of antimicrobial resistance patterns in diabetic patients and suggest that antibiotic therapy should be guided by culture and sensitivity results rather than empirical use.

Recommendations:

Based on the findings of this study, it is recommended that all diabetic patients, particularly those with poor glycemic control, should undergo routine urine culture screening to identify asymptomatic bacteriuria early. Since demographic and clinical factors such as age, gender, and HbA1c were not significantly associated with infection, reliance on these variables alone is not sufficient to predict bacteriuria. Instead, treatment decisions should be guided strictly by culture and antibiotic susceptibility results, given the highly significant differences observed in resistance patterns. Empirical use of antibiotics, especially ampicillin, should be avoided due to high resistance rates, while drugs such as gentamicin, ciprofloxacin, and amoxicillin may be considered effective against E. coli, which remains the predominant pathogen. Continuous local surveillance of antimicrobial resistance is strongly advised to monitor emerging resistance trends, and larger multicenter studies are needed to validate these findings and improve infection control strategies in diabetic populations.

REFERENCES

1. Ibrahim AO, Agboola SM, Elegbede OT, et al. Glycemic control and its association with sociodemographics, comorbid conditions, and medication adherence among patients with type 2 diabetes in southwestern Nigeria. *J Intern Med Res* 2021; 49: 3000605211044040.
2. Colgan R, Nicolle LE, McGlone A, Hooton TM: Asymptomatic bacteriuria in adults. Am Fam Physician. 2006, 74:985-990.
3. Bonadio M, Costarelli S, Morelli G, Tartaglia T: The influence of diabetes mellitus on the spectrum of uropathogens and the antimicrobial resistance in elderly adult patients with urinary tract infection. BMC Infect Dis. 2006, 6:54. 10.1186/1471-2334-6-54.
4. Wagenlehner FM, Bjerklund Johansen TE, Cai T, Koves B, et al Epidemiology, definition and treatment of complicated urinary tract infections. Nature Reviews Urology. 2020;17(10):586-600.
5. Laway BA, Nabi T, Bhat MH, Fomda BA. Prevalence, clinical profile and follow up of asymptomatic bacteriuria in patients with type 2 diabetes-prospective case control study in Srinagar, India. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2021;15(1):455-459.
6. Adegbite RB, Ojokuku HO, Adedokun KA, Oyenike MA, et al. Frequency and antibiotic susceptibility pattern of uropathogenic agents of urinary tract infections among asymptomatic diabetic patients in Okada community, southern Nigeria. Microbiologia Medica. 2019; 34(1): 1-6.

7. Nicolle LE: Asymptomatic bacteriuria in diabetic women. Diabetes Care. 2000, 23:722-723. 10.2337/diacare.23.6.722.
8. Turan H, Serefhanoglu K, Torun AN, Kulaksizoglu S, Kulaksizoglu M, Pamuk B, Arslan H: Frequency, risk factors, and responsible pathogenic microorganisms of asymptomatic bacteriuria in patients with type 2 diabetes mellitus. Jpn J Infect Dis. 2008, 61:236-238.
9. Bonadio M, Boldrini E, Forotti G, Matteucci E, Vigna A, Mori S, Giampietro O: Asymptomatic bacteriuria in women with diabetes: influence of metabolic control. Clin Infect Dis. 2004, 38:e41-e45. 10.1086/381755.
10. Papazafiropoulou A, Daniil I, Sotiropoulos A, Balampani E, Kokolaki A, Bousboulas S, et al Prevalence of asymptomatic bacteriuria in type 2 diabetic subjects with and without microalbuminuria BMC Res Notes. 2010;3:169.
11. Simkhada R. Urinary tract infection and antibiotic sensitivity pattern among diabetics. Nepal Med Coll J. 2013;15(1):1-4.
12. Jawad M, Khan SA, Ashraf S, Khan AJ, Sameen KA. Asymptomatic urinary tract infections and associated risk factors in diabetes mellitus patients attending a diabetes center of Peshawar, Pakistan. Journal of Rehman Medical Institute. 2018:4(3):18-23.
13. Matthiopoulou G, et al. Asymptomatic bacteriuria in patients with type 2 diabetes mellitus. J Diabetes Res. 2023;15(1):5.
14. Nigussie D, et al. Prevalence of uropathogen and their antibiotic resistance patterns among diabetic patients. BMC Infect Dis. 2017;17(1):1–7.
15. Nicolle LE, et al. Asymptomatic bacteriuria in patients with diabetes mellitus. Rev Infect Dis. 1991;13(2):150–154.
16. Aamir AH, et al. Characteristics of asymptomatic bacteriuria in diabetes mellitus patients: A retrospective observational study. Cureus. 2021;13(3):e13706.
17. Papazafiropoulou A, et al. Prevalence of asymptomatic bacteriuria in type 2 diabetic women. Diabetes Care. 2010;33(2):300–302.
18. Colgan R, et al. Asymptomatic bacteriuria. Am Fam Physician. 2020;102(2):99–106.
19. Zaidi SMJ, et al. Gauging the risk factors for asymptomatic bacteriuria in type 2 diabetic women: A case-control study. Cureus. 2020;12(11):e11459.
20. Harding GK, et al. Antimicrobial treatment in diabetic women with asymptomatic bacteriuria. N Engl J Med. 2002;347:1185–1190.
21. Cai T, et al. Asymptomatic bacteriuria treatment is associated with a higher occurrence of antibiotic-resistant bacteria. Clin Infect Dis. 2015;61(11):1655–1661.
22. Dai M, et al. Incidence and risk factors of asymptomatic bacteriuria in type 2 diabetes mellitus patients. Diabetes Metab Res Rev. 2023;39(1):e3476.
23. Abu-Humaidan AH, et al. Antimicrobial resistance of uropathogens in diabetic patients. BMC Infect Dis. 2025;25(1):113.
24. Bonadio M, et al. Influence of diabetes on the spectrum of uropathogens and antibiotic resistance patterns in urinary tract infection. BMC Infect Dis. 2006;6:54.
25. Chandra A, et al. IDF21-0242 Asymptomatic bacteriuria in patients with type 2 diabetes mellitus. Diabetes Res Clin Pract. 2022;183:109141.
26. Papazafiropoulou A, et al. Asymptomatic bacteriuria and antimicrobial susceptibility in type 2 diabetic patients. Diabetes Metab Syndr. 2012;6(4):161–165.
27. Gupta K, et al. Antimicrobial resistance among uropathogens in diabetes: A multicenter study. Clin Infect Dis. 2011;52(5):S375–S381.
28. Colgan R, et al. Current concepts in the management of asymptomatic bacteriuria in diabetes. Am J Med. 2019;132(8):921–929.
29. Nigussie D, et al. Correlation of HbA1c with prevalence of asymptomatic bacteriuria in diabetic patients. BMC Infect Dis. 2017;17(1):1–7.
30. Dai M, et al. Risk factors for asymptomatic bacteriuria in type 2 diabetes mellitus. Diabetes Metab Res Rev. 2023;39(1):e3476.
31. Aamir AH, et al. Asymptomatic urinary tract infections and associated risk factors in type 2 diabetes patients. BMC Infect Dis. 2021;21(1):106.
32. Matthiopoulou G, et al. Factors affecting asymptomatic bacteriuria in type 2 diabetes mellitus patients. J Diabetes Res. 2023;15(1):5.
33. Bonadio M, et al. Multidrug resistance patterns in urinary pathogens from diabetic patients. BMC Infect Dis. 2006;6:54.
34. Zaidi SMJ, et al. Risk factors of asymptomatic bacteriuria in type 2 diabetes. Cureus. 2020;12(11):e11459.