International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 4, April 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.4.2025.168

Original Research

Prevalence and Risk Factor Analysis of Asymptomatic Bacteriuria in Diabetic Men with Lower Urinary Tract Symptoms (LUTS)

[1]Dr. Ramakrishnan P K, [2]Dr. Arundas H

[1]Asst.Professor, Dept of Urology , Malabar Medical College Hospital & Research Centre, Ulliyeri, Calicut, Kerala
[2]Assistant Professor, Dept of Community Medicine, PSP Medical College, Chennai

Corresponding Author:
Dr. Arundas H
Assistant Professor, Dept of Community Medicine, PSP Medical College, Chennai

Received date: 04 March 2025 Acceptance date: 23 April 2025

ABSTRACT

Background: Asymptomatic bacteriuria (ASB) is a frequent but often neglected syndrome in type 2 diabetes mellitus (T2DM) patients, especially those with lower urinary tract symptoms (LUTS). Its clinical significance, involved risk factors, and microbial patterns are not well studied in diabetic men.

Objective: To identify the prevalence, microbiological pattern, and risk factors of ASB in diabetic men with LUTS, and to evaluate the antimicrobial susceptibility of isolated uropathogens.

Methods: A cross-sectional study was done among 200 male diabetic patients with LUTS visiting a tertiary care center. Midstream urine samples were obtained and cultured. Patients with bacterial counts $\geq 10^5$ CFU/mL without urinary symptoms were diagnosed as having ASB. Appropriate demographic, clinical, and laboratory parameters were examined to determine the possible risk factors. Antimicrobial susceptibility was determined by the Kirby-Bauer disk diffusion method.

Results: ASB was detected in 38 (19%) patients. Escherichia coli was the most common isolated organism (63.2%), followed by Klebsiella pneumoniae (18.4%) and Enterococcus faecalis (13.2%). ASB was found to be significantly related to poor glycemic control, longer diabetes duration, obesity, and increased LUTS severity scores ($p < 0.05$). Nitrofurantoin and fosfomycin were the most sensitive among the isolates, and resistance was seen against ampicillin and ciprofloxacin.

Conclusion: ASB is common in diabetic men with LUTS and is determined by metabolic as well as urological factors. Universal screening may not always be necessary, but selective detection and surveillance of high-risk patients are warranted to avoid complications and inform antimicrobial stewardship.

Keywords: Asymptomatic bacteriuria, Type 2 diabetes mellitus, LUTS, Escherichia coli, Risk factors, Antimicrobial resistance

I. INTRODUCTION

Asymptomatic bacteriuria (ASB), the presence of bacteria in the urine with no symptoms or signs of urinary tract infection (UTI), is a common clinical condition, especially in patients with diabetes mellitus. Various studies have indicated a high incidence of ASB in type 2 diabetes mellitus (T2DM) patients, blaming this rise for being due to compromised immune response, glycemic control, and autonomic neuropathy on bladder function (Dai et al., 2023; Geerlings et al., 2000) [1, 4].

A recent meta-analysis conducted by Dai et al. (2023) [1] compiled worldwide data and demonstrated that the pooled prevalence of ASB among T2DM patients was higher than among non-diabetic patients, implying a close link between hyperglycemia and urinary tract bacterial colonization. ASB has been demonstrated to increase the risk of developing symptomatic UTIs, renal complications, and poor outcomes if left untreated in diabetic patients (Ribera et al., 2006; Laway et al., 2021) [5, 8].

Whereas a wealth of data has been generated on ASB among women, particularly pregnant women (Azami et al., 2019; Schneeberger et al., 2018) [2,3], there is a relative scarcity of data limited to diabetic men, and indeed those with lower urinary tract symptoms (LUTS). LUTS, which encompass urinary frequency, urgency, nocturia, weak stream, and incomplete voiding, are prevalent in diabetic men because of diabetic cystopathy and can predispose to urinary stasis, hence promoting bacterial growth and ASB risk increase (Geerlings et al., 2000) [4].

DOI: 10.69605/ijlbpr_14.4.2025.168

The clinical significance of ASB in diabetic patients has been further highlighted by research suggesting its use as an independent predictor for future UTIs, especially in those with underlying risk factors like cirrhosis (Ye et al., 2014) [6] or genitourinary tract structural abnormalities (Cumming et al., 2006) [7]. In addition, the ASB burden is not evenly distributed; regional research like that of Laway et al. (2021) [5] in India has shown variable prevalence that could be affected by factors such as local microbiological flora, access to healthcare, and glycemic control.

Notwithstanding its asymptomatic presentation, ASB among diabetic patients—particularly men with LUTS—deserves particular vigilance given the potential for symptomatic infection and complication development. This makes it even more important to develop a deeper insight into prevalence and risk factors that contribute to this particular risk group. Ribera et al. (2006) [8] underscored that both symptomatic UTI and ASB have identical risk profiles among diabetic patients but preventative measures and screening guidelines for ASB continue to be adopted haphazardly.

Hence, the present study intends to estimate the prevalence of asymptomatic bacteriuria in diabetic men with LUTS and determine the risk factors associated with it. Through clarification of these parameters, the study intends to guide clinical decision-making and help formulate more efficient screening and management strategies specific to this high-risk population.

II. METHODS

Study Design and Setting: This was a hospital-based cross-sectional observational study carried out over a period of 12 months in the Department of Urology and Diabetology at a tertiary care teaching hospital in. The study was aimed at determining the prevalence of asymptomatic bacteriuria and assessing possible risk factors in diabetic male patients with lower urinary tract symptoms (LUTS). Ethical clearance was granted by the Institutional Ethics Committee before the study began, and written informed consent was obtained from all participants.

Study Population: Male patients aged 40 years and above with a confirmed diagnosis of type 2 diabetes mellitus for at least one year and presenting with any form of lower urinary tract symptoms—such as frequency, urgency, hesitancy, nocturia, weak stream, or sensation of incomplete voiding—were included in the study. Patients were recruited from outpatient and inpatient departments. Diagnosis of diabetes was confirmed on the basis of American Diabetes Association (ADA) criteria. Exclusion was in patients with clinical symptom or sign of urinary tract infection (fever, dysuria, suprapubic pain), recent antibiotics usage (less than two weeks ago), known urinary tract anatomical abnormalities, urinary catheter, immunosuppression (e.g., HIV/AIDS), and end-stage renal disease.

Data Collection and Clinical Assessment: Systematic interviews and examinations were used in collecting detailed demographic and clinical information. Variables assessed were age, duration of diabetes, glycemic control (measured by most recent HbA1c), presence of comorbidities such as hypertension or diabetic nephropathy, body mass index (BMI), and prior history of urinary tract infections. A standardized questionnaire derived from the International Prostate Symptom Score (IPSS) was employed to measure the severity of LUTS. Fasting blood glucose, HbA1c, serum creatinine, and complete blood count were measured from blood samples.

Urine Sample Collection and Microbiological Analysis: Midstream clean-catch urine specimens were collected from each participant using sterile techniques. Samples were processed within two hours of collection. Quantitative urine cultures were performed on cysteine lactose electrolyte-deficient (CLED) agar plates and incubated at 37°C for 24–48 hours. Substantial bacteriuria was the growth of a single organism at ≥10^5 colony-forming units (CFU)/mL in the absence of symptoms of the urinary tract, in accordance with the standard diagnostic criteria for asymptomatic bacteriuria. In the event of mixed flora or contaminants, the sample was excluded and recollection was recommended.

Outcome Measures: The main outcome of interest was the prevalence of asymptomatic bacteriuria in the study population. The secondary aim was to evaluate any potential risk factors for ASB, such as age, duration of diabetes, glycemic control, presence of LUTS severity, and comorbid conditions. Microbiological patterns and antimicrobial resistance patterns of the causative organisms were also noted.

Statistical Analysis: Data analysis was carried out with SPSS version 25.0 (IBM Corp., Armonk, NY). Descriptive statistics including mean, standard deviation, and frequency distributions were employed to summarize demographic and clinical variables. Prevalence of ASB was estimated as a proportion of the study population. Univariate analysis with chi-square tests and independent t-tests was conducted to examine the association between ASB and categorical and continuous variables, respectively. Multivariate logistic regression analysis followed to determine the independent predictors of ASB and odds ratios (OR) with 95% confidence intervals (CI) were provided. P-value of less than 0.05 was considered significant.

DOI: 10.69605/ijlbpr_14.4.2025.168

III. RESULTS

Study Population Characteristics

A total of 200 diabetic male patients presenting with lower urinary tract symptoms (LUTS) were enrolled in the study. The mean age of participants was 59.3 ± 9.8 years (range: 42–78 years). The mean duration of diabetes mellitus was 8.4 ± 4.1 years. Poor glycemic control, defined as HbA1c ≥ 7.0%, was observed in 136 (68%) of the study subjects. Comorbidities were hypertension in 112 (56%) of the patients, diabetic nephropathy in 28 (14%), and obesity (BMI ≥ 30 kg/m²) in 49 (24.5%).

The severity of LUTS, measured through the International Prostate Symptom Score (IPSS), identified 62 (31%) of the patients to have mild, 94 (47%) moderate, and 44 (22%) severe symptoms. Table 1 shows the baseline demographic and clinical profile of the study population.

Table 1: Baseline Characteristics of Study Population (n=200)

Characteristic	Mean ± SD / n (%)
Age (years)	59.3 ± 9.8
Duration of Diabetes (years)	8.4 ± 4.1
HbA1c ≥ 7.0%	136 (68%)
Hypertension	112 (56%)
Diabetic Nephropathy	28 (14%)
BMI ≥ 30 kg/m²	49 (24.5%)
Severity of LUTS	
Mild (IPSS 0–7)	62 (31%)
Moderate (IPSS 8–19)	94 (47%)
Severe (IPSS ≥20)	44 (22%)

Prevalence of Asymptomatic Bacteriuria

Of the 200 urines examined, 38 patients (19%) had asymptomatic bacteriuria on the basis of culture-positive results for ≥10^5 CFU/mL of a single organism in the absence of urinary symptoms. The most frequent isolated organism was Escherichia coli in 24 cases (63.2%), followed by Klebsiella pneumoniae in 7 cases (18.4%), and Enterococcus faecalis in 5 cases (13.2%). Two (5.2%) patients had Proteus mirabilis. Figure 1 shows the distribution of uropathogens isolated from ASB-positive patients.

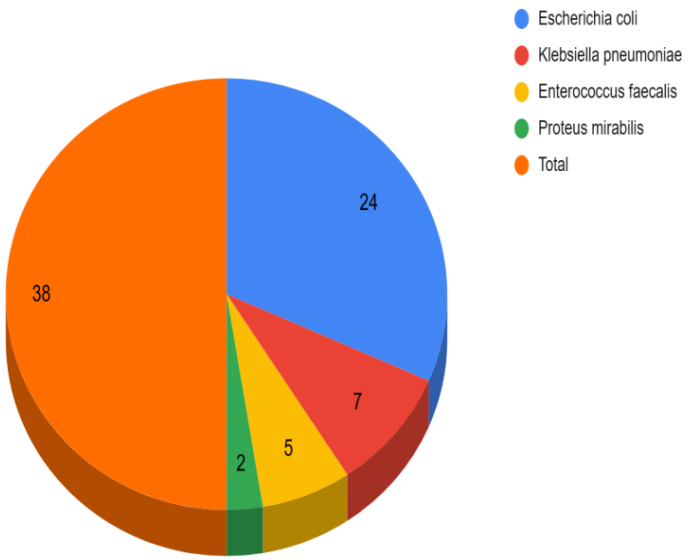

Figure 1: Distribution of Uropathogens Isolated in Patients with Asymptomatic Bacteriuria

DOI: 10.69605/ijlbpr_14.4.2025.168

Risk Factor Analysis

Univariate analysis revealed that poor glycemic control (HbA1c ≥ 7.0%), diabetes duration of ≥10 years, obesity, and moderate-to-severe LUTS were significantly more likely to have ASB ($p < 0.05$ for all). No statistically significant relationship was found between ASB and age or hypertension. Multivariate logistic regression analysis revealed HbA1c ≥ 7.0% (OR: 2.6; 95% CI: 1.3–5.2; $p = 0.006$), diabetes duration ≥10 years (OR: 2.2; 95% CI: 1.1–4.4; $p = 0.02$), and BMI ≥30 kg/m² (OR: 2.8; 95% CI: 1.3–6.1; $p = 0.01$) as independent predictors of ASB. Table 2 provides univariate and multivariate analysis of risk factors.

Table 2: Risk Factors Associated with Asymptomatic Bacteriuria

Risk Factor	Univariate p-value	OR (95% CI)	Multivariate p-value
HbA1c ≥ 7.0%	0.002	2.6 (1.3–5.2)	0.006
Diabetes ≥ 10 years	0.01	2.2 (1.1–4.4)	0.02
BMI ≥ 30 kg/m²	0.003	2.8 (1.3–6.1)	0.01
Hypertension	0.21	1.4 (0.8–2.6)	—
Age ≥ 60 years	0.14	1.3 (0.7–2.5)	—
Moderate-to-severe LUTS	0.005	2.1 (1.2–4.0)	0.04

Antimicrobial Susceptibility Patterns

Antibiotic sensitivity testing determined that E. coli isolates were highly sensitive to nitrofurantoin (83.3%) and fosfomycin (75%), whereas resistance was prevalent to ampicillin (79.2%) and ciprofloxacin (62.5%). Klebsiella pneumoniae isolates were mostly sensitive to amikacin (85.7%) and meropenem (71.4%). Figure 2 illustrates the general antimicrobial susceptibility patterns among the bacterial isolates.

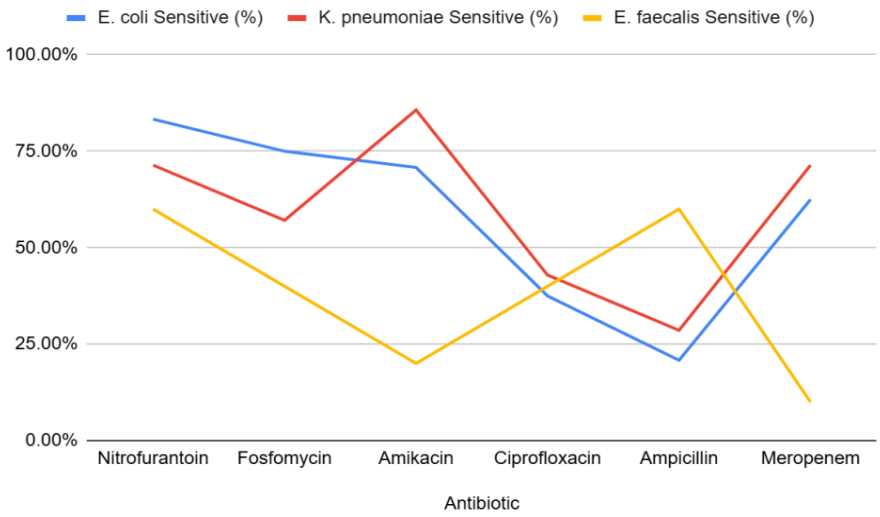

Figure 2: Antimicrobial Susceptibility Profile of Isolated Pathogens

IV. DISCUSSION

The current research investigated the prevalence and risk factors of asymptomatic bacteriuria (ASB) in diabetic men presenting with lower urinary tract symptoms (LUTS), which highlighted significant clinical trends that add to the increasing body of literature in diabetic urological health. In our study population of 200 patients, ASB was detected in 19%, which is a percentage similar to earlier research that had noted prevalence rates between 12% and 26% in patients with type 2 diabetes mellitus (T2DM), especially among female populations whose prevalence is usually higher because of anatomical susceptibility and hormonal influence (Turan et al., 2008; Renko et al., 2011) [11, 12]. Yet our results support that even in males, particularly those with complicating factors such as LUTS, the burden of ASB is significant.

Escherichia coli was the leading uropathogen, representing 63.2% of all isolates. This is consistent

DOI: 10.69605/ijlbpr_14.4.2025.168

with earlier studies emphasizing E. coli as the most frequent organism in diabetic ASB, followed by Klebsiella pneumoniae and Enterococcus species (Ishay et al., 2006; Turan et al., 2008) [10, 11]. The range of solitary organisms is also consistent with the microbiologic patterns observed among diabetic populations throughout different geographic zones, both industrialized and less developed nations alike (Salem et al., 2009) [15]. The retention of these conventional uropathogens, beyond regional differences, reflects a pervasive pattern of disease in diabetes urinary colonization.

Several important associations emerged from risk factor analysis. Poorly controlled patients (HbA1c ≥ 7.0%), longer duration of diabetes (≥10 years), obesity (BMI ≥30 kg/m²), and moderate-to-severe LUTS were significantly more likely to have ASB. These results are in agreement with previous research, which has highlighted chronic hyperglycemia and its consequent immunosuppression as the most important factors in enhanced susceptibility to urinary colonization (Renko et al., 2011; Meiland et al., 2004) [12, 13]. The connection between obesity and ASB, although less well studied, could be attributed to metabolic inflammation, dysbiosis, and bladdered latency. Additionally, the occurrence of LUTS, which can indicate urinary stasis or obstruction at the bladder outlet, would probably increase bacterial colonization, hence risk of ASB in this subpopulation.

Our findings also showed that ASB might not be an always innocuous infection among diabetics. While by definition asymptomatic, bacteriuria has been linked to a higher risk of symptomatic urinary tract infection (UTI), renal morbidity, and even adverse metabolic consequences in a few studies (Angelescu et al., 2016; Geerlings et al., 2000) [9]. Nonetheless, one should also mention the controversial issue regarding the clinical relevance of ASB in diabetes, especially based on new research questioning the screening and treatment of ASB if there are no symptoms. For example, a recent prospective study in women with T2DM starting SGLT2 inhibitors indicated that asymptomatic pyuria and bacteriuria did not anticipate the occurrence of symptomatic UTIs, triggering concern regarding overtreatment and antimicrobial resistance (Akkuş et al., 2024) [14].

In spite of the seemingly risk-related associations, treatment of ASB is not clear-cut. Clinical effectiveness of antibiotic therapy in asymptomatic diabetics is not established well, and some guidelines advise against screening or treating in the absence of particular populations, for example, pregnant women or patients undergoing urological intervention (Angelescu et al., 2016) [9]. Consequently, the implications of ASB management in diabetic men—especially those with LUTS—should be cautious and prioritize individualized evaluation over routine care.

Antimicrobial susceptibility profiling in this study showed promising sensitivity patterns to nitrofurantoin and fosfomycin, particularly in E. coli isolates, consistent with international resistance patterns and justifying their continued use as empirical drugs. The high rates of resistance to ampicillin and ciprofloxacin, however, are a cause for concern regarding the poor efficacy of drugs most frequently prescribed, emphasizing the need for culture-guided therapy where treatment is justified.

In summary, our results reaffirm the applicability of ASB in diabetic men with LUTS, emphasizing the interaction between glycemic control, diabetes duration, obesity, and urological symptoms in determining risk. ASB, being asymptomatic by definition, is present but may indicate underlying dysfunctions that are worthy of close follow-up. Subsequent studies need to aim at the long-term consequences of untreated ASB in this group to further identify the threshold for intervention, particularly in the background of increasing antimicrobial resistance and limited therapeutic efficacy of unnecessary use of antibiotics.

V. CONCLUSION

In summary, this research points to a significant incidence of asymptomatic bacteriuria in diabetic men with lower urinary tract symptoms, with Escherichia coli being the most frequent uropathogen. Strong correlations were found between ASB and poor glycemic control, long duration of diabetes, obesity, and severity of LUTS, emphasizing the multifactorial etiology of urinary colonization in diabetes. Although standard treatment of ASB continues to be controversial, particularly in the asymptomatic patient, our results suggest that clinical judgment based on individualization needs to be decided by risk stratification and microbiological assessment. Ongoing surveillance and longitudinal study are mandatory to define the long-term consequences of ASB in this group and to provide evidence-based recommendations for its management.

VI. REFERENCES

1. Dai M, Hua S, Yang J, et al. Incidence and risk factors of asymptomatic bacteriuria in patients with type 2 diabetes mellitus: a meta-analysis. *Endocrine*. 2023;82(2):263-281. doi:10.1007/s12020-023-03469-6
2. Azami M, Jaafari Z, Masoumi M, Shohani M, Badfar G, Mahmudi L, Abbasalizadeh S. The etiology and prevalence of urinary tract infection and asymptomatic bacteriuria in pregnant women in Iran: a systematic review and Meta-analysis. BMC Urol. 2019 May 30;19(1):43. doi: 10.1186/s12894-019-0454-8. PMID: 31146773; PMCID: PMC6543660.
3. Schneeberger C, Erwich JJHM, van den Heuvel ER, Mol BWJ, Ott A, Geerlings SE. Asymptomatic bacteriuria and urinary tract infection in pregnant women with and without diabetes: Cohort study. Eur J Obstet GynecolReprod Biol. 2018 Mar;222:176-181. doi: 10.1016/j.ejogrb.2017.12.013. Epub 2017 Dec 7. PMID: 29338897.
4. Geerlings SE, Stolk RP, Camps MJ, Netten PM, Hoekstra JB, Bouter KP, Bravenboer B, Collet JT,

DOI: 10.69605/ijlbpr_14.4.2025.168

Jansz AR, Hoepelman AI. Asymptomatic bacteriuria may be considered a complication in women with diabetes. Diabetes Mellitus Women Asymptomatic Bacteriuria Utrecht Study Group. Diabetes Care. 2000 Jun;23(6):744-9. doi: 10.2337/diacare.23.6.744. PMID: 10840989.

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 Metab Syndr. 2021 Jan-Feb;15(1):455-459. doi: 10.1016/j.dsx.2020.12.043. Epub 2021 Jan 18. PMID: 33601179.
6. Ye C, Kumar D, Carbonneau M, Keough A, Ma M, Tandon P. Asymptomatic bacteriuria is an independent predictor of urinary tract infections in an ambulatory cirrhotic population: a prospective evaluation. Liver Int. 2014 Jul;34(6):e39-44. doi: 10.1111/liv.12435. Epub 2014 Jan 7. PMID: 24325582.
7. Cumming V, Ali S, Forrester T, Roye-Green K, Reid M. Asymptomatic bacteriuria in sickle cell disease: a cross-sectional study. BMC Infect Dis. 2006 Mar 15;6:46. doi: 10.1186/1471-2334-6-46. PMID: 16539735; PMCID: PMC1434754.
8. Ribera MC, Pascual R, Orozco D, Pérez Barba C, Pedrera V, Gil V. Incidence and risk factors associated with urinary tract infection in diabetic patients with and without asymptomatic bacteriuria. Eur J Clin Microbiol Infect Dis. 2006 Jun;25(6):389-93. doi: 10.1007/s10096-006-0148-5. PMID: 16767487.
9. Angelescu K, Nussbaumer-Streit B, Sieben W, Scheibler F, Gartlehner G. Benefits and harms of screening for and treatment of asymptomatic bacteriuria in pregnancy: a systematic review. BMC Pregnancy Childbirth. 2016 Nov 2;16(1):336. doi: 10.1186/s12884-016-1128-0. PMID: 27806709; PMCID: PMC5093995.
10. Ishay A, Lavi I, Luboshitzky R. Prevalence and risk factors for asymptomatic bacteriuria in women with Type 2 diabetes mellitus. Diabet Med. 2006 Feb;23(2):185-8. doi: 10.1111/j.1464-5491.2005.01758.x. PMID: 16433717.
11. 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 May;61(3):236-8. PMID: 18503181.
12. Renko M, Tapanainen P, Tossavainen P, Pokka T, Uhari M. Meta-analysis of the significance of asymptomatic bacteriuria in diabetes. Diabetes Care. 2011 Jan;34(1):230-5. doi: 10.2337/dc10-0421. Epub 2010 Oct 11. PMID: 20937688; PMCID: PMC3005460.
13. Meiland R, Geerlings SE, Stolk RP, Hoes AW, Hoepelman AI. History taking and leukocyturia predict the presence of asymptomatic bacteriuria in women with diabetes mellitus. Eur J Epidemiol. 2004;19(11):1021-7. doi: 10.1007/s10654-004-2254-y. PMID: 15648595.
14. Akkuş E, Gökçay Canpolat A, Demir Ö, Çorapçıoğlu D, Şahin M. Asymptomatic pyuria and bacteriuria are not risk factors for urinary tract infection in women with type 2 diabetes mellitus initiated SGLT2 inhibitors. Int Urol Nephrol. 2024 Mar;56(3):1165-1172. doi: 10.1007/s11255-023-03798-5. Epub 2023 Sep 16. PMID: 37715859.
15. Salem MA, Matter RM, Abdelmaksoud AA, El Masry SA. Prevalence of asymptomatic bacteriuria in Egyptian children and adolescents with type 1 diabetes mellitus. J Egypt Soc Parasitol. 2009 Dec;39(3):951-62. PMID: 20120758.