Asymptomatic Urinary Tract Infection among students at Middle Technical University

Anwar M. Lazm[1], Alaa Saadi Abbood[2]
[1]Department of Optics Techniques, College of Health and Medical Techniques, Middle Technical University, Baghdad -Iraq.
[2]Iraqi center for cancer and medical genetic research/Mustansiriyah university,Baghdad- Iraq
*Corresponding Author: Anwar-mohammed@mtu.edu.iq

Received 13 Jan. 2025, Accepted 14 May. 2025, Published 30 June. 2025.

DOI: 10.52113/2/12.01.2025/143-155

Abstract: Asymptomatic urinary tract infections (UTIs), also referred to as asymptomatic bacteriuria, are defined by the presence of bacteria in the urinary tract in the absence of overt symptoms. This condition, which is particularly common among female college students, can result in severe infections if left untreated and contribute to antimicrobial resistance when mismanaged. The objective of the investigation is to investigate the prevalence, risk factors, and bacterial etiology of asymptomatic UTIs among students at Middle Technical University in Baghdad, Iraq. Methods: A descriptive cross-sectional study was conducted from February 2023 to May 2024, with 100 students, 49, 51 were males and female respectively within the age range of 18 to 24 years. selected through stratified random sampling. Self-administered questionnaires were utilised to collect data regarding personal history, health practices, and dietary patterns. MacConkey, CLED, and blood agar were employed to culture midstream urine samples, and standard biochemical assays were employed to identify microorganisms. In order to identify bacterial antibodies in serum samples, ELISA was implemented. The statistical analysis identified correlations between UTI positivity and demographic, behavioural, and clinical variables. Results: Asymptomatic bacteriuria was prevalent in 15% of the population, with a higher incidence in females (21.6%) than in males (8.2%). *Staphylococcus aureus* (33.3%) was the second most frequently identified pathogen, following *Escherichia coli* (46.7%). On-campus housing, inadequate hand hygiene, holding urine, low water intake, and prior UTI history were found to be risk factors substantially associated with UTI positivity ($p < 0.001$). The diagnostic accuracy of ELISA and culture was exceptional, with 100% sensitivity and specificity. Conclusion: This study indicates that students at Middle Technical University, particularly females, have a significant prevalence of asymptomatic urinary tract infections (UTIs). The study identifies inadequate hydration, poor hygiene practices, prolonged urine retention, and campus living conditions as specific risk factors that elevate the likelihood of infection. The necessity for targeted preventive strategies is underscored by the recent emergence of *Escherichia coli* and *Staphylococcus aureus* as the predominant uropathogens. The study shown that ELISA and urine culture are very accurate diagnostic methods, which is advantageous as asymptomatic UTIs can be challenging to detect. Regular screening of high-risk people is essential, since untreated asymptomatic bacteriuria may result in symptomatic infections and antibiotic resistance. To diminish the incidence of infections, it is essential to promote educational initiatives that underscore the need of appropriate cleanliness, enough hydration, and prudent antibiotic usage. To enhance treatment and preventative strategies, future research should assess health outcomes over extended durations and analyse bigger population samples.

Keywords: Asymptomatic, Bacteriuria, Middle Technical University, Students.

Introduction

Bacterial infections of the urinary tract (UTIs) may present as asymptomatic bacteriuria or as urine that is painless, burning, or devoid of fever when the germs do not exhibit any external indicators of

infection. In asymptomatic individuals, a urine culture frequently detects the condition's existence [1]. Annually, millions worldwide have urinary tract infections (UTIs), which are among the most common bacterial illnesses. Unlike symptomatic UTIs, which have garnered significant attention and study, asymptomatic bacteriuria—characterized by the presence of bacteria in the urinary tract without observable symptoms—is often neglected. The lifestyle, hygiene practices, and sexual behaviours of college students, particularly young women, increase their susceptibility to asymptomatic urinary tract infections compared to the general population [2]. Asymptomatic UTIs are significant since they may result in more severe infections in high-risk individuals if not detected promptly, and also contribute to the escalating issue of antibiotic resistance when treated unnecessarily. Advancements in preventative health interventions and successful clinical care are contingent upon a comprehensive understanding of the prevalence, causes, and implications of asymptomatic UTIs in this demographic. This study intends to address the frequently neglected health issue of silent urinary tract infections among college students. Urinary tract infections (UTIs) are a predominant cause of disability among college students and young adults, representing a significant public health issue globally. Asymptomatic bacteriuria, characterised by the presence of bacteria in the urinary system without evident symptoms, is frequently underdiagnosed and little researched in this demographic, unlike symptomatic urinary tract infections, which have garnered significant attention in medical literature .The condition is particularly significant due to its potential to create complications in vulnerable individuals and its role in exacerbating antibiotic resistance when improperly managed[4].The predominant cause of asymptomatic urinary tract infections is gram-negative bacteria, chiefly *Escherichia coli*. Additional bacterial species have been identified, including *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Enterococcus* spp. College students are more susceptible to bacterial colonisation in their urinary tracts due to variables such as sexual activity, inadequate hydration, poor hygiene practices, and the use of spermicides. Exposure to uropathogens may be significantly elevated in college environments due to community facilities and shared accommodations [5]. Understanding the prevalence of silent urinary tract infections, the bacterial agents responsible, and the risk factors affecting college students is crucial. This information may guide evidence-based treatment strategies, improve screening processes for at-risk individuals, and shape targeted health education initiatives to mitigate antibiotic misuse. To address a substantial knowledge deficit about a neglected health issue.In an effort to fill a significant information vacuum on an understudied health problem, this research looks into the microbiological cause, risk factors, and consequences of asymptomatic UTIs in university students. Most healthy college students shouldn't get tested for asymptomatic UTIs on a regular basis, but it could be necessary for some people like those who get UTIs often, have diabetes, or are having invasive procedures done on their urinary tract. To develop focused health treatments, mitigate unnecessary antibiotic consumption, and tackle the growing concern of antimicrobial resistance, it is essential to comprehend the prevalence, distribution of bacterial species, and the need of appropriate screening methods among college students. This study aims to examine these features to highlight this neglected population and provide evidence-based management options. Urinary tract infections (UTIs) are among the most prevalent bacterial illnesses. Young

persons, particularly college students, face an increased risk of acquiring these illnesses. Asymptomatic bacteriuria, characterised by the presence of bacteria in the urinary tract without manifest symptoms, is frequently underdiagnosed and little comprehended, unlike symptomatic urinary tract infections that generally prompt medical care. In high-risk people, such those with diabetes, structural abnormalities, or immunosuppression, consequences might develop from untreated silent UTIs, even when there are no symptoms. Mismanagement of the illness, leading to needless antibiotic prescriptions, exacerbates the problem of antimicrobial resistance, which is becoming worse by the day [6]. In order to understand the condition's epidemiology and identify at-risk patients, screening for asymptomatic UTIs is crucial. The development of preventative measures, such as the promotion of hydration, the improvement of hygiene education, and the encouragement of safe sexual activities, depends on our understanding of the prevalence, bacterial species, and related risk factors among college students. Targeted screening, risk factor management, and antibiotic stewardship are crucial in reducing the likelihood of complications and tackling public health issues associated with asymptomatic UTIs; this study intends to examine the epidemiology of these infections in this population.

Materials and methods

Research methodology

the present study was a descriptive cross-sectional analysis of 100 students, 49, 51 were males and female respectively within the age range of 18 to 24 years. chosen using a stratified random sample approach. The current investigation was carried out from February 2023 to May 2024 across Middle Technical University in Baghdad, Iraq. Personal information, a history of urinary tract infections (UTIs), health-related hygiene practices, food preferences, and behaviours were all part of the data obtained by self-administered questionnaires. One hundred undergraduates had 5 millilitres of venous blood sampled and kept under strict aseptic conditions, while sterile wide-containers were used to collect midstream pee.

Isolation and identification of bacteria by urine culture: Within an hour, the remaining urine sample was tested for microbes. The blood, MacConkey, and CLED agar were cultured according to standard protocols. After 24 hours of aerobic incubation at 37°C, the colonies that formed were counted to identify cases of significant bacteriuria, defined as "more than 100,000 organisms/ml"14. After the bacterial colonies were counted, the various biochemical features of the bacteria were used for identification. Colour responses were used to indicate enzyme activity, such as lactase, fermentation, and urease, when bacteria were grown in various mediums [7]. The tubes used for serum separation were utilised to collect the blood samples in order to detect bacterial antibodies. It was determined that specific bacterial antibodies (IgG) were present using an enzyme-linked immunosorbent test [8].

Results and discussion

This study aimed to ascertain the prevalence of asymptomatic bacteriuria among 100 otherwise healthy students at Middle Technical University. The prevalence of asymptomatic bacteriuria was noted in 15% of the population. Numerous research studies in India have consistently indicated prevalence rates of asymptomatic bacteriuria (ASB) between 6% and 18% [9] [10]. Table 1 presents a comparison of subgroups based on age and sex. A substantial disparity

($p < 0.001$) is seen in UTI positive rates among all age groups. The 23–24 age group has the greatest positive rate at 20% (7 out of 35 samples). Younger cohorts (ages 18–20 and 21–22) exhibit statistically significant disparities. Females have a greater UTI positive rate (21.6%) than men (8.2%), with $p < 0.001$. This corresponds with data indicating that females are more susceptible to UTIs due to anatomical and physiological reasons. Several variables elucidate this gender discrepancy, including: Anatomical disparities, women possess a shorter urethra (about 4 cm) in contrast to males (approximately 20 cm), facilitating the ascent of germs from the external environment to the bladder. proximity to the anus. The female urethra's proximity to the anus heightens the risk of bacterial contamination, particularly from *E. coli*, the predominant cause of urinary tract infections. hormonal Influences Oestrogen has a preventive function by sustaining the vaginal microbiota; nevertheless, hormonal variations (e.g., during menstruation, pregnancy, and menopause) can disturb the equilibrium of beneficial bacteria (such as *Lactobacillus*), increasing women's vulnerability to infections. Hygiene and Behavioural Influences, Retaining Urine, The research indicated that students who retain urine for extended durations are at an increased risk of urinary tract infections, a behaviour more prevalent among females owing to cultural and academic pressures [11] [12]. This outcome does not aligned with the findings of Mangai et al. (2019), which indicated that most respondents were aged 18 to 20 years [13][14][15].

Table 1: Culture results of urine samples, according to demographics variables

Characteristics	No of sample Tested (100)	No. of positive UTI (15)	No. of negative UTI(85)	P- value
Age Group (in years)				
18-20	20	3	17	< 0.001
21-22	45	5	40	< 0.001
23-24	35	7	30	< 0.001
Gender				
Female	51	11	40	< 0.001
Male	49	4	45	< 0.001

Table two illustrates the proportion of the screening tests. The catalase test exhibits the greatest positive rate at 31%, whilst the leukocyte esterase test demonstrates the lowest at 14%.

A combination of tests (Nitrite, Leukocyte esterase, and/or Catalase) enhances detection, yielding a 39% positive rate. These findings emphasise the necessity for a multifaceted approach to provide effective UTI screening.

Although plate cultures are regarded as the gold standard for detecting bacteriuria, other approaches are frequently utilised due to time constraints and cost-effectiveness in

processing urine cultures. Techniques such as urinalysis and urine dipsticks for nitrites or leukocyte esterase (LE) yield rapid and cost-effective results relative to plate cultures [16][17].

Other investigations comparing the pee dipstick test and other urinalysis parameters against gold standard urine cultures indicated that leukocyte esterase is the most accurate. A research has shown that the leukocyte esterase component of the dipstick test exhibits the greatest reliability and validity [18].

Table 2: Screening Test Results

Tests	Positive	Percentage
Nitrite test	8	16 %
Leukocyte esterase	7	14 %
Catalase test	16	31 %
Nitrite, leukocyte esterase and/or catalase tests	20	39 %

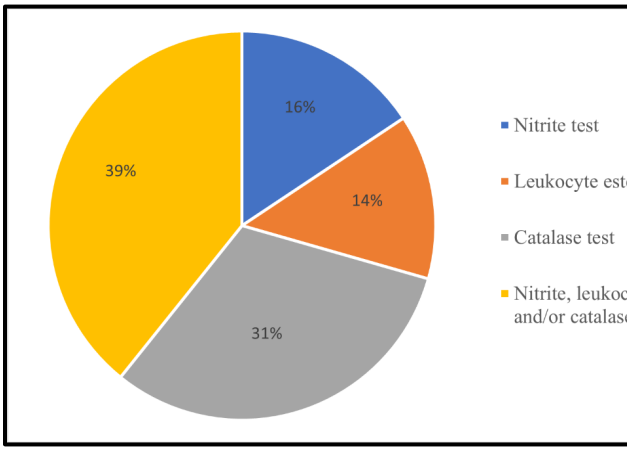

Figure 1 percentages of screening test

Both the ELISA and culture tests show excellent diagnostic performance with 100% sensitivity, specificity, PPV, and NPV. ELISA has a slightly higher Area Under the Curve (AUC) than culture, which highlights its potential for effective screening. Table 3 shows the distribution of different bacterial isolates among males and females, showing that the frequency of bacteria in females is higher than in males. However, the differences in frequency did not reach significance, with a p-value of > 0.005. This study employed the ELISA (Enzyme-Linked Immunosorbent Assay) method to identify bacterial antibodies in serum samples, focussing on IgG antibodies targeting bacterial pathogens. This approach is essential as it offers a highly sensitive and specific way to identify bacterial infections, enhancing traditional urine culture techniques. The investigation revealed that ELISA exhibited 100% sensitivity and specificity, establishing it as an exceptionally dependable technique for identifying asymptomatic urinary tract infections (UTIs). In addition to Urine Culture, the integration of ELISA with conventional culture techniques improves the detection rate and provides a more thorough analysis of asymptomatic UTI cases. ELISA is effective in identifying the immune response of the body to bacteria, even when the bacterial levels in urine are insufficient for culture-based detection. The integration of ELISA with conventional culture techniques improves the detection rate and provides a more thorough examination of asymptomatic UTI cases [18] [19].

(Table 3): Results of screening tests compared to culture.

Test		Sensitivity	Specificity	PPV	NPV	AUC	P value
ELISA							
86(-ve)	(+ve) 14	100%	100%	100%	100%	100 %	< 0.001
Culture		**Sensitivity**	**Specificity**	**PPV**	**NPV**	**AUC**	**P value**
(-ve) 85	(+ve) 15	100%	100%	100%	100%	99.6 %	< 0.001

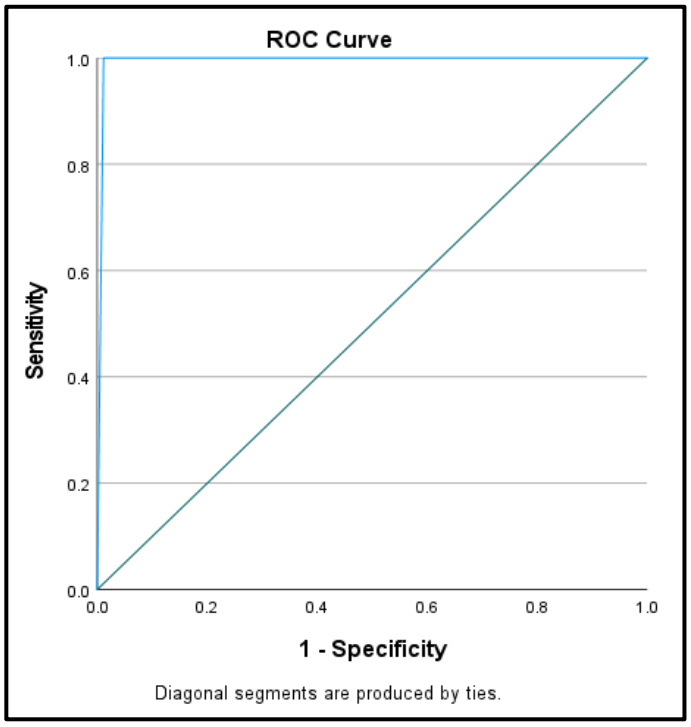

Figure 2 ROC of EISA test

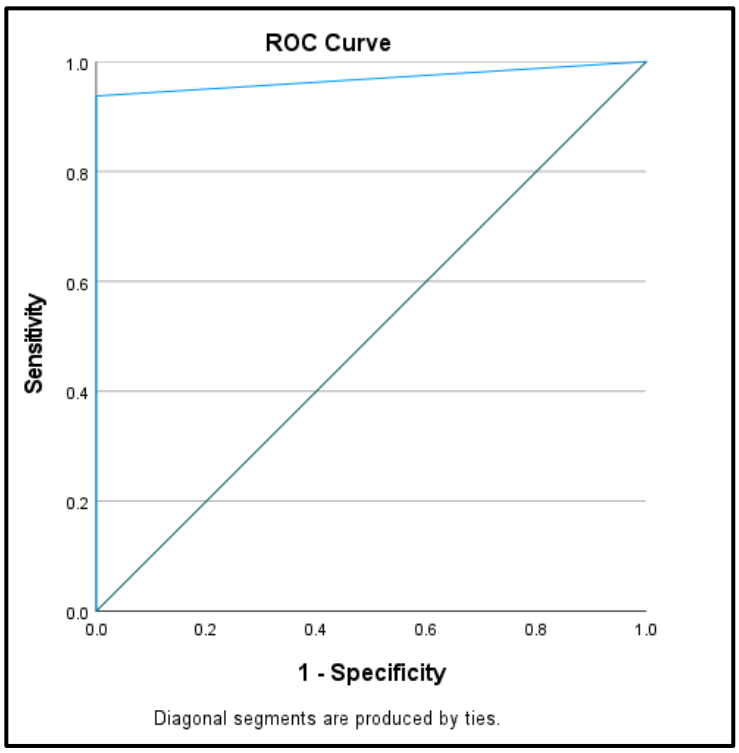

Figure 3 ROC of Culture

Optics Technologies and Medical Laboratory Technologies participants had the greatest positive rate (4 instances each), according to Table 4, and all of these differences are statistically significant ($p < 0.001$). No UTI-positive cases have been reported from Radiologic Technologies or any other department, which may indicate that there are differences in risk behaviours or environmental exposures throughout departments.

Table (4): distribution of UTI depending on the departments of the students at the College of Health and Medical Technologies/Baghdad

Department	No. of positive UTI (15)	No. of negative UTI(85)	P- value
Physiotherapy Technologies (14)	0	13	< 0.001
Community Health Technologies (14)	3	11	< 0.001
Optics Technologies (15)	4	11	< 0.001
Medical Laboratory Technologies (15)	4	11	< 0.001
Anesthesia and Intensive Care (14)	2	12	< 0.001
Radiologic Technologies (14)	0	14	< 0.001
Prosthetic Dental Techniques (14)	2	12	< 0.001
Total (100)			

Table 5 illustrates the distribution of several bacterial isolates.*Escherichia coli* (*E. coli*) is the predominant isolate (7 out of 15 cases), succeeded by *Staphylococcus aureus* (5 out of 15). Female isolates occur more frequently; nevertheless, the variations in frequency between genders are not statistically significant ($p > 0.05$).

Escherichia coli is the predominant bacteria among departments, aligning with its designation as the principal pathogen in urinary tract infections. The disparities between departments are not substantial ($p > 0.05$). This data aligns with research conducted by Ali Al Youssef in 2020, which found that 41.42% of isolations were *E. coli.* Previous research indicated that *E. coli* (32.08%) was the predominant bacterium responsible for urinary tract infections, whereas *Staphylococcus* (24.53%) ranked as the second most prevalent uropathogen in our study (Hossain *et al.,* 2021). [19] [20].

(Table 5): Types of bacterial isolates in cases of asymptomatic bacteria.

Types of bacterial isolates	**Number of isolates(15)**	**Gender**		**P- value**
		Female	Male	
Escherichia coli (E.coli)	7	4	3	**> 0.05**
Staphylococcus aureus	5	3	2	**> 0.05**
Klebsiella pneumoniae	2	2	0	**> 0.05**
Enterobacter spp.	1	1	0	**> 0.05**

Table 6 indicates that students residing in on-campus accommodation exhibit markedly elevated UTI rates relative to those living at home ($p < 0.001$), likely attributable to communal facilities and hygiene issues. Comparable outcomes were observed among students from government universities in Nigeria, as reported by Onyebueke et al., 2020. Paudel et al. (2018) indicated that the absence of bathroom facilities was a substantial risk factor for the incidence of urinary tract infections (UTIs) [21].

Consuming less than 1 litre of water daily is a substantial risk factor (OR = 114.125, $p < 0.001$), underscoring the importance of hydration in the prevention of urinary tract infections. Unsanitary college restrooms and inadequate handwashing practices are substantially associated with UTI positive ($p < 0.001$). Students who retain urine exhibit a greater incidence of urinary tract infections ($p < 0.001$), highlighting behavioural risk factors. A previous history of urinary tract infections elevates the likelihood of a current infection (OR = 5, $p < 0.001$), consistent with findings from earlier studies [22] [23].

Table 6. Prevalence of asymptomatic UTI among students, according to risk factors.

Characteristics	No. of positive UTI (15)	No. of negative UTI (85)	P- value	Odd Ratio: OR	95% CI
Living condition/residency					
Home	8	82	< 0.001	0.042	0.0089, 0.194
On-campus housing	7	3			

Daily water intake					
>1 liter	11	2	< 0.001	114.125	5.5,25.8
<1 liter	4	83			
Hand washing after toilet					
Washes	13	84	< 0.001	0.0774	0.01, 0.77
Does not wash	2	1			
Cleanliness of the college toilets					
Clean	3	80	< 0.001	0.0156	0.002,0.11
Dirty	12	5			
Holding urine					
Not holding urine	4	77	< 0.001	0.0615	0.02,0.16
Holding urine	11	13			
History of UTI					
Yes	10	20	< 0.001	5	1.95,12.85
No	5	50			

Table 7 indicates that chronic diseases and drugs do not exhibit significant relationships with UTI positive ($p > 0.05$). Nonetheless, self-medication with antibiotics is prevalent, prompting worries over antimicrobial resistance.

In the other research, a prior history of UTI was found to be extremely important, with other concomitant illnesses such as diabetes. The correlation between urinary tract infections and diabetes as predisposing variables was further validated by Nguefack et al. [24] and more research [25][26].

Table (7) Chronic Illness and Present UTIs Complaints among students at Middle Technical University

Characteristics	**yes**			**No**		
	No. of positive UTI (15)	**No. of negative UTI(85)**	**P- value**	**No. of positive UTI (15)**	**No. of negative UTI(85)**	**P-value**
Do you have any chronic illness?	2	1	> 0.05	1	84	> 0.05
Do you take any medication?	2	0	> 0.05	13	85	> 0.05
Do you use antibiotics without a prescription	11	5	> 0.05	4	80	> 0.05
Do you previously complain from UTIs	10	10	> 0.05	5	75	> 0.05

Consuming salty or spicy meals did not have a clear correlation with the risk of UTIs ($p > 0.05$), while increasing fluid intake did (Table 8). Caffeine intake and a preference for foods strong in acidity (such as lemon and orange) do not substantially impact the likelihood of UTIs. This finding was consistent with that of Bokolia (2016), who found that almost half of the sampled population changed their sanitary pads and washed their vagina after using the lavatory. More than half of the students in the survey reported not drinking enough fluids on a daily basis; they also reported a strong taste for spicy and salty meals, as well as a large intake of tea and coffee. Contrarily, acidic foods are more often eaten by them. Hussein et al. (2014) found that about half of the participants drank a lot of water, which is somewhat in line with the present result. [27,28,29].

Table (8): Health-related Eating Habits of the students at Middle Technical University with Asymptomatic UTI

Characteristics	yes			No		
	No. of positive UTI (15)	No. of negative UTI(85)	P- value	No. of positive UTI (15)	No. of negative UTI(85)	P-value
Do you drink many fluids a day?	5	80	> 0.05	10	5	< 0.05
Do you drink a lot of coffee/tea a day	10	10	> 0.05	5	75	> 0.05
Do you prefer to eat high acidic food (lemon, oranges, and chocolates)?	11	5	> 0.05	4	80	> 0.05
Do you prefer spicy food	13	5	> 0.05	2	80	> 0.05
Do you prefer salty	11	2	< 0.05	4	83	> 0.05

Conclusion

Middle Technical University students, especially females, have a high rate of asymptomatic urinary tract infections (UTIs), according to this study. Inadequate hydration, poor hygiene habits, retaining urine for lengthy times, and on-campus living circumstances are listed as particular risk factors that increase the incidence of infection, according to the study. The need for focused preventative measures is further highlighted by the fact that *Escherichia coli* and *Staphylococcus aureus* have recently emerged as the leading uropathogens. Also, the study showed that ELISA and urine culture are very accurate diagnostic tools, which is great because asymptomatic UTIs can be hard to spot. It is critical to screen high-risk populations regularly because untreated asymptomatic bacteriuria can lead to symptomatic infections and antibiotic

resistance. In order to reduce the number for infections, it is important to foster educational programs that emphasizes the need of proper hygiene, staying hydrated, and using antibiotics wisely. In order to create better management and preventive plans, future studies should evaluate health outcomes over longer periods of time and examine larger samples of the community.

References

1. Koljalg, S., Truusalu, K., Vainumäe, I., Stsepetova, J., Sepp, E., & Mikelsaar, M. (2009). Persistence of Escherichia coli clones and phenotypic and genotypic antibiotic resistance in recurrent urinary tract infections in childhood. *Journal of clinical microbiology*, *47*(1), 99-105.
2. Sheppard, M., Ibiebele, I., Nippita, T., & Morris, J. (2023). Asymptomatic bacteriuria in pregnancy. Australian and New Zealand Journal of Obstetrics and Gynaecology, 63(5), 696-701.
3. Renard, J., Ballarini, S., Mascarenhas, T., Zahran, M., Quimper, E., Choucair, J., & Iselin, C. E. (2015). Recurrent lower urinary tract infections have a detrimental effect on patient quality of life: a prospective, observational study. Infectious diseases and therapy, 4, 125-135.
4. Zeng, Z., Zhan, J., Zhang, K., Chen, H., & Cheng, S. (2022). Global, regional, and national burden of urinary tract infections from 1990 to 2019: an analysis of the global burden of disease study 2019. World Journal of Urology, 40(3), 755-763.
5. Bilsen, M. P., Conroy, S. P., Schneeberger, C., Platteel, T. N., van Nieuwkoop, C., Mody, L., ... & Van der Beek, M. (2024). A reference standard for urinary tract infection research: a multidisciplinary Delphi consensus study. The Lancet Infectious Diseases.
6. Karam, M. R. A., Habibi, M., & Bouzari, S. (2019). Urinary tract infection: Pathogenicity, antibiotic resistance and development of effective vaccines against Uropathogenic Escherichia coli. Molecular immunology, 108, 56-67.
7. Zhang, S., Aida, H., & Ying, B. W. (2023). Active learning for medium optimization for selective bacterial culture. bioRxiv, 2023-11.
8. Kerttula, Y., Leinonen, M., Koskela, M., & Mäkelä, P. H. (1987). The aetiology of pneumonia. Application of bacterial serology and basic laboratory methods. Journal of Infection, 14(1), 21-30.
9. Lavanya, S. V., & Jogalakshmi, D. (2002). Asymptomatic bacteriuria in antenatal women. *Indian journal of medical microbiology*, *20*(2), 105-106.
10. Mishra, D., Kalra, A., Bhide, A. R., & Singh, M. (2024). Risk Factors and Clinical Outcomes of Asymptomatic Bacteriuria in Pregnant Women: A Comprehensive Analysis. *Cureus*, *16*(5).
11. Minardi, D., d'Anzeo, G., Cantoro, D., Conti, A., & Muzzonigro, G. (2011). Urinary tract infections in women: etiology and treatment options. International journal of general medicine, 333-343.
12. Cai, T., Mazzoli, S., Mondaini, N., Meacci, F., Nesi, G., D'Elia, C., ... & Bartoletti, R. (2012). The role of asymptomatic bacteriuria in young

women with recurrent urinary tract infections: to treat or not to treat?. Clinical infectious diseases, 55(6), 771-777.

13. Mangai, M. J., Gaknung, B., Hosea, G., Peter, U., Patience, K., Shikpup, N., ... & David, S. (2019). Assessment of knowledge and prevention practices of urinary tract infection (UTI) among female students residence in university of Jos. International research journal of public and environmental health.
14. Finnell, S. M., Carroll, A. E., & Downs, S. M. (2011). Subcommittee on urinary tract infection. Pediatrics, 128, e749-e770.
15. Mohammed, A., Abdelfattah, M., Ibraheem, A., & Younes, A. (2016). A study of asymptomatic bacteriuria in Egyptian school-going children. African health sciences, 16(1), 69-74.
16. Tincello, Douglas G., and David H. Richmond. "Evaluation of reagent strips in detecting asymptomatic bacteriuria in early pregnancy: prospective case series." *Bmj* 316.7129 (1998): 435-437.
17. Nayak, U. S., Solanki, H., & Patva, P. (2010). Utility of dipstick versus urine culture in diagnosis of urinary tract infection in children. *Gujarat Med J*, *65*, 20-2.
18. Owens, D. K., Davidson, K. W., Krist, A. H., Barry, M. J., Cabana, M., Caughey, A. B., ... & US Preventive Services Task Force. (2019). Screening for asymptomatic bacteriuria in adults: US Preventive Services Task Force recommendation statement. *Jama*, *322*(12), 1188-1194.
19. Kerttula, Y., Leinonen, M., Koskela, M., & Mäkelä, P. H. (1987). The aetiology of pneumonia. Application of bacterial serology and basic laboratory methods. Journal of Infection, 14(1), 21-30.
20. Xu, N., Wang, W., Chen, F., Li, W., & Wang, G. (2020). ELISA is superior to bacterial culture and agglutination test in the diagnosis of brucellosis in an endemic area in China. BMC infectious diseases, 20, 1-7.
21. Ali Al Youssef, S., Ghareeb Mohamed, A., Ahmed Abdelrahman, R., Mohamed Abo Baker, R., Ibrahim Abass, N., & Khalafalla Ahmed Masaad, H. (2020). Asymptomatic Urinary Tract Infection among Female University Students. Egyptian Journal of Health Care, 11(4), 341-353.
22. Hossain, I., Bhowmik, S., Uddin, M. S., Devnath, P., Akter, A., Eti, L. N., ... & Islam, M. T. (2021). Prevalence of urinary tract infections, associated risk factors, and antibiotic resistance pattern of uropathogens in young women at Noakhali, Bangladesh.
23. Paudel, L., Manandhar, N., Sah, S., Khadka, S., Neupane, S., & Joshi, S. K. (2018). Prevalence of urinary tract infection and associated risk factors among women in Sindhupalchowk district, Nepal. International Journal of Community Medicine and Public Health, 5(7), 2714.
24. Zincir, H., Kaya Erten, Z., Özkan, F., Seviğ, Ü., Başer, M., & Elmalı, F. (2012). Prevalence of urinary tract infections and its risk factors in

elementary school students. *Urologia internationalis*, *88*(2), 194-197.

25. Tchente Nguefack, C., Okalla Ebongue, C., Nouwe Chokotheu, C., Ebong Ewougo, C., Nana Njamen, T., & Mboudou, E. (2019). Clinical presentation, risk factors and pathogens involved in bacteriuria of pregnant women attending antenatal clinic of 3 hospitals in a developing country: a cross sectional analytic study. *BMC Pregnancy and Childbirth*, *19*, 1-6.
26. Agarwal, A., Pandey, S., Maheshwari, U., Singh, M. P., Srivastava, J., & Bose, S. (2021). Prevalence of asymptomatic bacteriuria and antimicrobial resistance profile among pregnant females in a Tertiary Care Hospital. *Indian Journal of Community Medicine*, *46*(3), 469-473.
27. Bokolia, R. (2016). Assessment of Knowledge of Urinary Tract Infection (UTI) Amongst School-Going Adolescent Girls. Value in Health, 19(7), A631.
28. Hussein K., Palpitany S. and Ahmed S. (2014): Prevalence of urinary tract infection among secondary school students in urban and rural in Erbil:Comparative study. KUFA Journal for nursing sciences. 4(3):1-6
29. Malki, K., Sible, E., Cooper, A., Garretto, A., Bruder, K., Watkins, S. C., & Putonti, C. (2016). Seven bacteriophages isolated from the female urinary microbiota. *Genome Announcements*, *4*(6), 10-1128.