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PREVALENCE OF CULTURE-PROVEN URINARY TRACT INFECTIONS IN PEDIATRIC PATIENTS WITH LOWER URINARY TRACT SYMPTOMS

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ABSTRACT

BACKGROUND: Urinary tract infections (UTIs) are among the most common bacterial infections in children. If untreated or mismanaged, they can lead to renal scarring, hypertension, and chronic kidney disease. Culture confirmation is essential to ensure accurate diagnosis and guide antibiotic selection, especially in the context of increasing antimicrobial resistance.

OBJECTIVE: To determine the prevalence of culture-proven urinary tract infection among children presenting with lower urinary tract symptoms (LUTS) at a tertiary care center in Peshawar, Pakistan.

METHODOLOGY: A cross-sectional study was conducted from May to November 2024 conducted in the Department of Urology, Khyber Teaching Hospital, Peshawar, Pakistan, from May 2024 to November 2024. A total of 195 children aged ≤15 years with lower urinary tract infection were enrolled. Midstream urine samples were collected and processed for culture and susceptibility testing in the hospital microbiology laboratory. A positive urine culture was defined as growth of a single recognized uropathogen at or above 10^5 Colony forming Units per mL in a clean-catch midstream urine sample.

RESULTS: Out of 195 children (mean age 8.7 ± 5.0 years), 172 (88.2%) had positive urine cultures. Culture positivity was significantly higher in females than males (92.7% vs. 82.4%, p=0.026) and showed a strong inverse relationship with age, with the highest rate in children ≤5 years (96.7%).

CONCLUSION: In this tertiary-care urology clinic, 88.2% of children presenting with lower urinary tract infection had a positive urine culture. This reflects diagnostic yield in a referral setting. Routine urine culture should be integrated into diagnostic practice to improve accuracy and guide appropriate antibiotic use.

KEYWORDS: Pediatric urinary tract infection; Lower urinary tract symptoms; Urine culture positivity; Culture-confirmed Urinary tract Infection

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INTRODUCTION

Urinary tract infections (UTIs) are among the most frequent bacterial infections in children and remain a major cause of morbidity worldwide[1]. Clinical manifestations can be non-specific in younger children, often delaying diagnosis and increasing the risk of renal damage[2]. Furthermore, relying solely on clinical symptoms for diagnosis can be unreliable, as symptoms such as dysuria, frequency, urgency, and suprapubic discomfort are not always indicative of infection[3]. If left untreated or recurrent, UTIs can result in renal scarring, hypertension, and impaired renal function later in life[4].

The global burden of pediatric UTI is substantial. Studies report prevalence ranging from 7% to 14% depending on age, gender, and presenting symptoms[5]. Females are more commonly affected due to shorter urethral length and anatomical factors, while uncircumcised male infants are at increased risk during the first year of life[6]. Lower urinary tract symptoms (LUTS)—are frequent presentations in outpatient and emergency settings.

International and national guidelines recommend urine culture as the diagnostic gold standard for suspected pediatric UTIs[7,8]. Culture not only confirms the diagnosis but also identifies the causative organism and its antimicrobial susceptibility pattern, which is crucial in guiding rational treatment. This has become increasingly important as antimicrobial resistance in uropathogens continues to rise, with extended-spectrum beta-lactamase (ESBL), producing organisms now reported even in community-acquired pediatric infections[9,10].

In Pakistan and other low- and middle-income countries, the problem is compounded by widespread over-the-counter antibiotic use and limited access to diagnostic laboratories[11]. Local studies have highlighted high resistance rates among Escherichia coli and other gram-negative bacilli isolated from pediatric UTIs, raising serious concerns for empirical therapy[12,13]. Despite this, urine culture is often underutilized in routine practice, leading to misdiagnosis and inappropriate treatment.

Given these challenges, it is essential to generate updated local data on the prevalence of culture-proven UTIs in children presenting with LUTS. Such evidence will guide clinicians in improving diagnostic accuracy, selecting appropriate antibiotics, and preventing long-term complications. This study was therefore conducted to determine the frequency of culture-proven UTI among children with LUTS in a tertiary care setting in Peshawar.

METHODOLOGY:

This descriptive cross-sectional study was conducted in the Department of Urology at Khyber Teaching Hospital, Peshawar, Pakistan, over a six-month period from May 2024 to November 2024. The study aimed to assess urine culture positivity among pediatric patients presenting with lower urinary tract symptoms in a tertiary-care urology outpatient setting.

The sample size was calculated using the WHO formula for a single proportion. An expected prevalence of pediatric urinary tract infection (UTI) of 20%, based on a recent study conducted in Peshawar, a 95% confidence level, and a 5% margin of error yielded a minimum required sample size of 246 participants. However, due to the fixed recruitment period and the number of eligible presentations during the study window, a total of 195 participants were ultimately enrolled. Non-probability consecutive sampling was employed, and the resulting estimate reflects urine culture positivity among symptomatic clinic attendees rather than community prevalence.

All pediatric patients aged 15 years or younger presenting to the urology outpatient department with lower urinary tract symptoms were eligible for inclusion. Patients were excluded if they had a history of culture-confirmed UTI within the preceding two months, known anatomical or functional urinary tract abnormalities such as urinary stones, diverticula, urethral strictures, or neurogenic bladder, or other conditions that could potentially bias urine culture results.

Lower urinary tract symptoms were assessed based on caregiver or patient history. Dysuria was recorded when pain or a burning sensation during urination was reported. Urinary urgency was defined as a sudden, compelling need to pass urine that was difficult to defer. Increased daytime urinary frequency was considered present when the child voided more than eight times during waking hours. Lower abdominal pain was documented when suprapubic pain or discomfort in the lower midline abdomen above the pubic bone was reported. A culture-proven UTI was defined as the isolation of a single recognized uropathogen at a concentration of at least 10^5 colony-forming units (CFU) per milliliter from a clean-catch midstream urine specimen. Febrile UTI was diagnosed when fever was present at presentation or within the preceding 24–48 hours, whereas afebrile UTI was defined as culture-proven UTI in the absence of fever.

Written informed consent was obtained from parents or guardians, and assent was taken from older children when appropriate. Demographic and clinical data, including age, sex, history of diabetes or renal disease, recent catheterization, socioeconomic status, immunosuppressive therapy, and other comorbidities, were recorded using a structured proforma. Body temperature was not measured in a standardized manner for all participants; therefore, analysis comparing febrile and afebrile UTI was not performed.

Each participant provided a clean-catch midstream urine sample, which was processed in the hospital microbiology laboratory. Urine culture and antimicrobial susceptibility testing were carried out using standard laboratory protocols. A positive urine culture was defined as the growth of a single recognized uropathogen at or above 10^5 CFU/mL, while cultures showing mixed growth were considered contaminated and coded as negative. Following data collection, patients were managed according to hospital treatment guidelines.

Data analysis was performed using SPSS version 27. Continuous variables were expressed as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages. Associations between urine culture results and key variables with adequate cell counts were assessed using the chi-square test. Subgroups with very small numbers were described descriptively and were not used for inferential analysis. Statistical significance was set at a p-value of ≤0.05, and results were presented in tabular form.

Ethical approval for the study was obtained from the institutional review committee no. 564/DME/KMC.

RESULTS

Baseline characteristics

A total of 195 pediatric patients with LUTS were enrolled. The mean age was 8.7 ± 5.0 years (range 1–15). Most patients were 6–12 years (43.6%), followed by ≤5 years (30.8%) and 13–15 years (25.6%). Females were more common than males (56.4% vs 43.6%). The average symptom duration was 8.3 ± 9.2 days, with 76.9% presenting within the first week, 20.5% between 8–30 days, and 2.6% after one month. Diabetes was present in 10 children (5.1%). Eight (4.1%) were receiving immunosuppressive therapy. Five (2.6%) had a history of catheterization. Five (2.6%) reported tuberculosis history.

Table 1. Baseline characteristics of study participants.

Variable	Value
Age (years)	Mean ± SD = 8.7 ± 5.0 (range 1–15)
≤5 years	60 (30.8%)
6–12 years	85 (43.6%)
13–15 years	50 (25.6%)
Sex	Male 85 (43.6%), Female 110 (56.4%)
Duration of symptoms (days)	Mean ± SD = 8.3 ± 9.2
≤7 days	150 (76.9%)
8–30 days	40 (20.5%)
>30 days	5 (2.6%)
Diabetes mellitus	10 (5.1%)
Immunosuppressive therapy	8 (4.1%)
Catheterization	5 (2.6%)
Tuberculosis history	5 (2.6%)

Out of 195 patients, 172 (88.2%) had culture-proven UTI, while 23 (11.8%) had negative urine cultures.

Urine culture results by age group and sex are shown in Table 2. Among children aged <=5 years, 58 of 60 (96.7%) were culture-positive. In the 6-12 years group, 80 of 85 (94.1%) were culture-positive. In the 13-15 years group, 34 of 50 (68.0%) were culture-positive (p = 0.010).

Among females, 102 of 110 (92.7%) were culture-positive. Among males, 70 of 85 (82.4%) were culture-positive (p = 0.026). Other baseline characteristics are summarized in Table 1.

Table 2. Urine culture results among children with LUTS.

Variable	Category	Total n	Culture positive n (%)	Culture negative n (%)	p value
Age group	<=5 years	60	58 (96.7)	2 (3.3)	
	6-12 years	85	80 (94.1)	5 (5.9)	0.010
	13-15 years	50	34 (68.0)	16 (32.0)	
Sex	Male	85	70 (82.4)	15 (17.6)	0.026
	Female	110	102 (92.7)	8 (7.3)	

DISCUSSION

In this tertiary-care urology clinic series, we found that 88.2% of children presenting with lower urinary tract symptoms had culture-confirmed UTI. This positivity rate greatly exceeds that reported in general pediatric settings; for example, only ≈6% of acutely ill children under 5 seen in family practice have UTI on culture[16]. Even other referral populations report much lower yields – for instance, Mitiku et al. observed positive cultures in only 27.5% of symptomatic Ethiopian outpatients[17], and a Karachi pediatric center found 19.7% of suspected cases culture-positive[18]. Similarly, a Peshawar pediatric clinic series reported 50% positivity[19].These comparisons indicate that our very high yield likely reflects case-selection in a referral population: children with persistent or complicated LUTS were sent to the urology clinic, enriching the sample for true infection. Thus, our estimate represents the diagnostic yield in this referral setting and should not be interpreted as the community prevalence of pediatric UTI.

Consistent with known epidemiology, we saw higher culture-positivity in females (92.7%) than males (82.4%), and in younger children (96.7% in ≤5 years, declining with age). Female sex and young age are well-documented risk factors for pediatric UTI; for example, by age 7 roughly 8.4% of girls versus 1.7% of boys will have a symptomatic UTI. Anatomical factors (shorter urethra in girls) and the risk to uncircumcised infant boys both explain these patterns[20]. Our findings suggest that the vast majority of culture-positive cases were girls, and nearly all children under 5 had infection. The strong association with female sex and young age in our data is consistent with multiple studies of pediatric UTI[21].

Relying on symptoms alone to diagnose UTI can be misleading.

We found that many children with LUTS truly had infection, but conversely symptoms are neither sensitive nor specific. Indeed, systematic reviews show that individual urinary symptoms (like dysuria or frequency) have limited rule-in value[16]. Similarly, routine urine dipstick or microscopy can miss infection in a sizable fraction of children[19]. Current guidelines therefore emphasize obtaining a urine culture when UTI is suspected, especially in children with unexplained fever or significant urinary symptoms[22]. Our data reinforce this approach: in our study, nearly nine of ten children with LUTS had true infection, underscoring that symptom-based diagnosis alone could lead to both missed cases and unnecessary empiric treatment. Culture confirmation allows appropriate antibiotic selection and avoids over-treatment of non-infectious LUTS.

Compared to other published cohorts, our culture-positivity is remarkably high. As noted, Mitiku et al. found only 27.5% positivity among outpatient children with suspected UTI[17]. In Pakistan, Khan et al. reported 19.7% culture positivity in a pediatric center in Karachi[18], and Salahuddin et al. found 50% in a Peshawar pediatric series[19]. Nazme *et al.* found 58 of 120 outpatient children (48.3%) with suspected UTI had positive cultures[23]. This tertiary-hospital study in Dhaka saw roughly half of cases culture-positive – higher than many reports, yet still much lower than our study. These differences are likely due to setting and selection: our clinic population was pre-screened and likely had refractory or recurrent symptoms, whereas general outpatient series include many children in whom UTI is only one possible diagnosis. In short, our figures reflect diagnostic yield under intensive selection, not general prevalence. Therefore, we refrain from extrapolating these percentages to broader community or primary-care populations.

Antimicrobial resistance among pediatric uropathogens is a growing concern, especially in South Asia. Although our study performed culture and susceptibility testing, we did not report the resistance data here. Nevertheless, regional reports are alarming: for example, a recent Lahore study found essentially universal resistance to agents like ampicillin, cefuroxime and cephalosporins in children's urinary E. coli isolates[24]. Mitiku et al. similarly noted >70% resistance of E. coli to amoxicillin and nearly 100% to cotrimoxazole[17]. In this context, our finding of culture-confirmed UTI highlights the need for culture-guided therapy. Empirical antibiotics should be chosen based on local antibiograms, with prompt de-escalation once sensitivities return. Culture-based management in pediatric UTI is strongly endorsed by experts, both to ensure effective treatment and to minimize unnecessary broad-spectrum antibiotic use in a setting of high resistance[16].

Our study has important limitations. It was conducted at a single tertiary urology center using consecutive (non-random) sampling, so our study is not representative of the general pediatric population. By design this referral sample is enriched for symptomatic cases, and the high culture-positivity thus reflects this bias. Consequently, our results should not be taken as estimates of community UTI prevalence. The sample size was somewhat smaller than planned, reducing precision and limiting power for subgroup analyses. We also did not systematically classify febrile versus afebrile infections, and lacked follow-up imaging or outcome data on renal scarring. In spite of these limitations, our findings are instructive for similar clinical settings.

In summary, culture-proven UTI was very common among referred children with LUTS, especially in girls and in those under 5 years of age. This likely reflects selection in a specialist clinic rather than general population prevalence. Our findings emphasize that symptoms alone cannot reliably distinguish infection – urine culture remains the gold standard. In practice, routine culture of urine from children with suggestive symptoms should guide antibiotic prescribing. Such culture-based care promotes rational antibiotic use in a region beset by resistance, and may help prevent treatment delays and long-term complications of pediatric UTI.

CONFLICT OF INTEREST

The author declare no conflict of interest related to this publication

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REFERENCES

1.Elabidi JS, Salih AF, Abusarayi MF. Epidemiological and Clinical Characteristics of Pediatric Urinary Tract Infections in Benghazi, Libya: A Two-Year Retrospective Study. Al-Mukhtar Journal of Sciences. 2025 Jun 30;40(1):52-6. https://doi.org/10.54172/

2.Nelson Z, Aslan AT, Beahm NP, et al. Guidelines for the prevention, diagnosis, and management of urinary tract infections in pediatrics and adults: a WikiGuidelines consensus statement. JAMA Netw Open. 2024;7(11): https://doi.org/10.1001/jamanetworkopen.2024.44495

3.Maringhini S, Catalano P, Calagna G, et al. Urinary tract infection in children: an up-to-date study. Biomedicines. 2024;12(11):2582.

https://doi.org/10.3390/biomedicines12112582

4.Pediatrics in Review. Urinary tract infections in children. Pediatr Rev. 2024;45(5):260–75. https://doi.org/10.1542/pir.2023-001018

5.Shkalim Zemer V, Cohen Y, Keness Y, et al. Pathogens causing pediatric community-acquired urinary tract infections and antimicrobial resistance trends: a nationwide study. Microorganisms. 2024;12(1):66. https://doi.org/10.3390/microorganisms12010066

6.Lu J, Chen Q, Yang C, et al. Clinical and microbial etiology characteristics in pediatric urinary tract infection. Front Pediatr. 2022;10:844797. https://doi.org/10.3389/fped.2022.844797

7.Wang X, Liu Y, Wang Y, et al. Risk factors and antimicrobial

resistance in children with ESBL-producing Escherichia coli urinary tract infections: a multicenter study. J Glob Antimicrob Resist. 2023;31:111–8.

https://doi.org/10.1016/j.jgar.2022.11.021

8.Esposito S, Biasucci G, Pasini A, et al. Antibiotic resistance in pediatric febrile urinary tract infections: a multicenter study. J Glob Antimicrob Resist. 2022;29:499–506. https://doi.org/10.1016/j.jgar.2021.11.003

9.Park KS, Kim S, Lee J, et al. Susceptibility to fosfomycin and nitrofurantoin of ESBL-positive pediatric urinary isolates. J Korean Med Sci. 2023;38:e361.

https://doi.org/10.3346/jkms.2023.38.e361

10.Khan MA, Raza S, Akhtar K, et al. Pediatric uropathogens and their antimicrobial susceptibility pattern: experience from a tertiary pediatric center in Karachi, Pakistan. Clin Med Insights Pediatr. 2024;18:11.

https://doi.org/10.1177/11795565241254321

11.Anjum F, Iqbal M, Malik M, et al. Antimicrobial resistance and susceptibility pattern of UTI-causing microorganisms in Southern Punjab, Pakistan. Int J Med Students. 2024;12(1):45–52. https://doi.org/10.5195/ijms.2024.2163

12.Dantas M, Eckard AR, Morrisette T, et al. Antibiotic appropriateness for urinary tract infections in children. Hosp Pediatr. 2024;14(11):909–18.

https://doi.org/10.1542/hpeds.2024-007756

13.American Academy of Pediatrics. A national quality improvement collaborative to improve pediatric UTI care. Pediatrics. 2024;153(5):e2023062246. https://doi.org/10.1542/peds.2023-062246

14.Khan A, Ahmad F, Bibi M, Khan I, Said S. Frequency of urinary tract infection in children with nephrotic syndrome. The Professional Medical Journal. 2023 May 2;30(05):604-10.

15.Bagnasco F, Piaggio G, Mesini A, et al. Epidemiology of antibiotic-resistant pathogens in pediatric urinary tract infections: toward a prediction model for drug-specific resistance. Antibiotics (Basel). 2022;11(6):720. https://doi.org/10.3390/antibiotics11060720

16.Boon HA, Van den Bruel A, Struyf T, Gillemot A, Bullens D, Verbakel JY. Clinical features for the diagnosis of pediatric urinary tract infections: systematic review and meta-analysis. The Annals of Family Medicine. 2021 Sep 1;19(5):437-46. https://doi.org/10.1370/afm.2684

17.Mitiku E, Amsalu A, Tadesse BT. Pediatric urinary tract infection as a cause of outpatient clinic visits in southern Ethiopia: a cross sectional study. Ethiopian journal of health sciences. 2018 Mar 22;28(2):187-96. https://doi.org/10.4314/ejhs.v28i2.10

18.Khan MA, Shakeel N. Pediatric uropathogens and their antimicrobial susceptibility pattern: Experience from an impoverished district of Karachi, Pakistan. Clinical Medicine Insights: Pediatrics. 2024 Jun;18:11795565241254321. https://doi.org/10.1177/11795565241254321

19.Salahuddin A, Ahmad S, Jan AZ, Zahid B, Khan A, Khan H, Saeed A, Hassan M. Diagnostic accuracy of urine routine examination for diagnosis of urinary tract infection in different pediatric age groups taking culture as gold standard: a single center study from Peshawar. Journal of Rehman Medical Institute. 2021;7(4):15-7. https://doi.org/10.52442/jrmi.v7i4.368

20.Barola S, Grossman OK, Abdelhalim A. Urinary tract infections in children. InStatPearls 2024 Jan 11. StatPearls Publishing.

21.Rajendran K, Shankar K. A study of prevalence of culture positive UTI in children: clinical profile, risk factor analysis, and microbiological profile. https://doi.org/10.18203/2349-3291.ijcp20185518

22.Shaikh N, Ewing AL, Bhatnagar S, Hoberman A. Risk of renal scarring in children with a first urinary tract infection: a systematic review. Pediatrics. 2010 Dec 1;126(6):1084-91. https://doi.org/10.1542/peds.2010-0685

23.Nazme N, Ahsan M, Jalil F, Fatema N. Childhood urinary tract infection: clinical & laboratory profile in a tertiary care hospital of Bangladesh. Journal of Advances in Medicine and Medical Research. 2018 May 18;26(7):1-9.

https://doi.org/10.9734/JAMMR/2018/33827

24.Iqbal Z, Sheikh AS, Basheer A, Hafsa HT, Ahmed M, Sabri AN, Shahid S. Antibiotic drug resistance pattern of uropathogens in pediatric patients in Pakistani population. Antibiotics. 2023 Feb 15;12(2):395. https://doi.org/10.3390/antibiotics12020395

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A.Conception or Design
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved