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FREQUENCY OF URINARY TRACT INFECTION (UTI) IN CHILDREN PRESENTING WITH FEVER

Original Research

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ABSTRACT

Background: Urinary tract infection (UTI) is one of the most frequent bacterial causes of fever in children and often remains underdiagnosed due to its nonspecific presentation. Early recognition is critical, as delayed diagnosis can lead to complications such as renal scarring, hypertension, or sepsis. Identifying the frequency of UTI among febrile children, especially those without localized symptoms, is essential to enhance clinical vigilance and improve diagnostic accuracy.

Objective: To evaluate the frequency of urinary tract infections in children presenting with fever and identify associated clinical risk factors.

Methods: This cross-sectional study was conducted at the Department of Pediatrics, Hayatabad Medical Complex, Peshawar. A total of 202 children aged 0–5 years presenting with fever >100.4°F (38°C) of less than 7 days' duration were enrolled using consecutive non-probability sampling. Children with prior UTIs, recent antibiotic use, congenital urinary anomalies, or requiring hospitalization were excluded. Clean-catch midstream or catheterized urine samples were collected under aseptic conditions. Initial screening was performed using dipstick testing for leukocyte esterase and nitrite, followed by confirmation via urine culture, where $\geq 10^5$ CFU/mL of a single uropathogen was considered diagnostic. Data were analyzed using SPSS version 25, with significance set at $p<0.05$.

Results: Of the 202 children enrolled, 92 (45.5%) were male and 110 (54.5%) female, with a mean age of 2.91 ± 1.40 years. UTI was confirmed in 29 children (14.4%). Among UTI-positive cases, 19 (65.5%) were aged 1–3 years, and 23 (79.3%) had a fever duration of more than 24 hours. Dysuria was reported in 14 (48.3%) cases, while frequent urination was present in 8 (27.6%).

Conclusion: UTI was identified in a considerable proportion of febrile children, particularly among those with prolonged fever exceeding 24 hours. These findings advocate for routine urine evaluation in febrile pediatric cases lacking a clear source.

Keywords: Bacteriuria, Child, Fever, Prevalence, Risk Factors, Urinary Tract Infections, Urine Culture.

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INTRODUCTION

Febrile illnesses in children represent a common cause of pediatric consultations in both outpatient and emergency care settings, often prompting clinical concern for serious underlying infections. While conditions such as occult bacteremia and other severe bacterial infections frequently draw early clinical attention, urinary tract infections (UTIs) are often under-recognized despite being a significant cause of fever in children. UTIs account for approximately 4–10% of febrile hospital admissions in the pediatric population, ranking as the third most common infection in childhood after respiratory and gastrointestinal illnesses (1,2). In many cases, fever may be the only presenting symptom, leading to diagnostic challenges and, at times, the initiation of empirical antibiotics without an appropriate evaluation for UTI. Diagnosing UTIs in children, particularly infants and toddlers, is further complicated by the non-specific nature of clinical symptoms and the child's limited ability to communicate discomfort or localize pain (3). This often results in delayed diagnosis or misdiagnosis, especially in cases where no overt signs of urinary involvement are present. Furthermore, certain anatomical and congenital abnormalities such as vesicoureteral reflux (VUR) and obstructive uropathies significantly increase the risk of recurrent UTIs and associated complications including acute pyelonephritis, sepsis, renal scarring, and long-term sequelae such as hypertension and chronic kidney disease (4,5).

Epidemiological data consistently demonstrate that UTIs are particularly prevalent among specific high-risk groups, with the highest incidence reported in uncircumcised males under three months and females under twelve months of age (6). Diagnostic evaluation typically relies on urinalysis as a first-line investigation, but its clinical utility depends heavily on accurate interpretation and confirmation through urine culture to prevent both over-treatment and under-diagnosis (7). In selected cases, imaging studies such as voiding cystourethrography (VCUG) and renal ultrasonography may be indicated to detect anatomical anomalies; however, these procedures must be used judiciously given their associated risks, including radiation exposure, procedural discomfort, and elevated healthcare costs (8,9). One notable study screened 1,675 febrile children presenting to an emergency department and identified UTIs in 15.5% of infants, underscoring the importance of routine consideration of UTIs in the differential diagnosis of pediatric fever (10). Given the clinical and epidemiological significance of UTIs in febrile children, it is essential to accurately quantify their frequency within specific populations to inform clinical decision-making, optimize diagnostic protocols, and guide the allocation of healthcare resources. The objective of this study is to determine the frequency of urinary tract infections in children presenting with fever, thereby contributing to improved diagnostic awareness and more effective management strategies for pediatric febrile illnesses.

METHODS

This cross-sectional study was conducted at the Department of Pediatrics, Hayatabad Medical Complex, Peshawar, after obtaining ethical approval from the Institutional Review Board (IRB). Data collection began after synopsis approval and continued until the targeted sample size was achieved. A total of 202 children aged 0 to 5 years who presented with fever of ≥38°C lasting less than seven days were enrolled. The sample size was calculated using OpenEpi software, referencing a previously reported urinary tract infection (UTI) prevalence of 15.5% (10), with a 95% confidence interval and a 5% margin of error. A consecutive non-probability sampling technique was used for participant selection. Children were included if they met the age and fever criteria and had no prior diagnosis of UTI. Exclusion criteria included recent antibiotic use within the past 72 hours, known structural anomalies of the urinary tract, or any critical illness necessitating immediate hospitalization (10,11). Informed written consent was obtained from the parents or guardians before enrollment. Demographic data such as age, gender, weight, parental education, occupation, and socioeconomic status were gathered using structured interviews with caregivers. Clinical information including duration of fever, highest recorded temperature, and any accompanying symptoms—such as vomiting, lethargy, dysuria, or poor feeding—was documented at presentation.

Urine collection was carried out under aseptic conditions. For toilet-trained children, clean-catch midstream urine specimens were obtained following proper perineal cleaning. In infants and non-toilet-trained children, sterile urine collection bags were used as a non-invasive method, with close monitoring to minimize contamination risk. If a bag-collected sample yielded a positive dipstick result or was suggestive of infection based on clinical grounds, a repeat sample was collected via catheterization to ensure diagnostic accuracy. All urine specimens were initially tested using dipstick analysis for leukocyte esterase and nitrites. Samples with positive dipstick results

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were further evaluated through urine culture and sensitivity testing. A culture was considered positive if it showed $\geq 10^5$ colony-forming units per milliliter (CFU/mL) of a single uropathogen (12,13). Data analysis was conducted using SPSS version 25. Continuous variables were summarized as means and standard deviations, while categorical variables were presented as frequencies and percentages. Associations between UTI and various demographic or clinical factors were assessed using the Chi-square test. A p-value less than 0.05 was considered statistically significant.

RESULTS

The study included a total of 202 children aged 0 to 5 years, with a mean age of 2.91 ± 1.40 years and a mean body weight of 13.94 ± 2.88 kg. The mean recorded body temperature was 101.84 ± 2.88°F, and the average duration of fever prior to presentation was 25.54 ± 9.75 hours. Among the participants, 92 (45.5%) were male and 110 (54.5%) were female. Slightly more than half of the parents were educated (54.0%), while 46.0% were uneducated. In terms of socioeconomic status, 35.6% of children belonged to lower-income families (monthly income <50,000 PKR), 45.0% to middle-income families (50,000–150,000 PKR), and 19.3% to higher-income groups (>150,000 PKR). Regarding parental employment, 42.1% were employed and 57.9% were unemployed. Urinary tract infection was microbiologically confirmed in 29 children, representing a frequency of 14.4% among the febrile pediatric population studied. Clinical evaluation revealed that among those diagnosed with UTI, dysuria was reported in 14 children (48.3%), frequent urination in 8 (27.6%), and irritability in 6 (20.7%). Only one case (3.4%) reported suprapubic pain. A prior history of UTI was found in 20 children (9.9%), while 28 (13.9%) had recently used antibiotics. Clean-catch midstream urine collection was successful in 71.3% of cases, while 28.7% required catheterization. Most urine samples appeared clear (85.6%), while 13.9% were cloudy and 0.5% showed visible hematuria. On urine dipstick testing, leukocyte esterase alone was positive in 5.9%, nitrite in 4.0%, and both markers in 4.5%. However, 85.6% of cases were negative for both markers.

When analyzing factors associated with UTI, children with fever duration of more than 24 hours showed a significantly higher UTI frequency, observed in 23 out of 29 UTI-positive cases (79.3%) compared to 72 out of 173 UTI-negative cases (41.6%) (P = 0.0001). Gender did not exhibit a statistically significant association with UTI, although male children had a slightly higher frequency (51.7%) compared to females (48.3%) (P = 0.47). Age distribution also showed no significant relationship with UTI positivity (P = 0.84), though the majority of UTI cases (65.5%) were in the 1–3 year age group. Further stratification of urinary tract infection cases by clinical and demographic parameters revealed several insights. Parental education level showed no significant association with UTI occurrence, with similar frequencies observed among children of educated (15/109) and uneducated (14/93) parents (P = 0.95). Socioeconomic status also did not significantly influence UTI rates, with UTI detected in 15.3%, 13.2%, and 15.4% of children from lower, middle, and higher-income households respectively (P = 0.91). Similarly, parental employment status demonstrated no meaningful correlation with UTI frequency (P = 0.45). Analysis of recent antibiotic use revealed a trend toward lower UTI positivity among those recently treated, though the difference was not statistically significant (P = 0.08). Regarding urine characteristics, cloudy urine was more frequently associated with UTI (6/28; 21.4%) than clear urine (22/173; 12.7%), but this did not reach statistical significance (P = 0.13). Hematuria was seen in one child and was associated with confirmed UTI. Dipstick positivity for leukocyte esterase, nitrites, or both showed a strong predictive association with UTI, though statistical analysis was limited due to small cell sizes in non-negative categories. Urine collection method also did not yield a significant association with UTI status, although UTI positivity was observed more frequently in catheterized specimens (9/58; 15.5%) compared to clean-catch samples (20/144; 13.9%) (P = 0.78). These findings suggest that, aside from fever duration, most other demographic and clinical variables studied did not independently predict UTI in this cohort. However, the limited statistical power in some subgroups may have influenced the ability to detect significant associations.

Table 1: Demographic profile

Demographics		Frequency	Percentage
Gender	Male	92	45.5%
	Female	110	54.5%
Parent's education	Educated	109	54.0%
	Uneducated	93	46.0%
Socioeconomic status	Lower Class (Income less than 50,000)	72	35.6%
	Middle Class (Income greater than 50,0000 and less than 1,50,000)	91	45.0%
	Higher class (Income greater than 1,50,000)	39	19.3%
Parent's professional status	Employed	85	42.1%
	Unemployed	117	57.9%

Table 2: Clinical and laboratory profile

Clinical and laboratory profile		Frequency	Percentage
Associated symptoms of UTI	Dysuria	14	48.3%
	Frequent urination	8	27.6%
	Suprapubic Pain	1	3.4%
	Irritability	6	20%
History of UTI	Yes	20	9.9%
	No	182	90.1%
Recent antibiotic use	Yes	28	13.9%
	No	174	86.1%
Urine collection method	Clean-catch midstream	144	71.3%
	Catheterization	58	28.7%
Appearance of urine	Clear	173	85.6%
	Cloudy	28	13.9%
	Hematuria	1	0.5%
Results of dipstick test	Leukocyte Esterase Positive	12	5.9%
	Nitrite Positive	8	4.0%
	Both Positive	9	4.5%
	Negative	173	85.6%

Table 3: Association of Age, Gender, and Fever Duration with Urinary Tract Infection in Febrile Children

Parameters		UTI				P value
		Yes		No		
		Frequency	Percentage	Frequency	Percentage	
Age distribution (Years)	1 to 3	19	65.5%	110	63.6%	0.84
	4 to 5	10	34.5%	63	36.4%	
Gender	Male	15	51.7%	77	44.5%	0.47
	Female	14	48.3%	96	55.5%	
Duration of fever (Hours)	< = 24	6	20.7%	101	58.4%	0.0001
	> 24	23	79.3%	72	41.6%	

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Table 4: The Association of Urinary Tract Infection (UTI) With Various Clinical and Demographic Variables

Variable	Category	UTI Positive (n)	UTI Negative (n)	P value
Parent's Education	Educated	15	94	0.9523
	Uneducated	14	79	
Socioeconomic Status	Lower	11	61	0.9119
	Middle	12	79	
	Higher	6	33	
Parental Employment	Employed	10	75	0.4518
	Unemployed	19	98	
Recent Antibiotic Use	Yes	2	26	0.0837
	No	27	147	
Urine Appearance	Clear	22	151	0.1365
	Cloudy	6	22	
	Hematuria	1	0	
Urine Collection Method	Clean-catch	20	124	0.7826
	Catheterization	9	49	
Dipstick Results	Leukocyte Esterase	12	0	<0.0001
	Nitrite	8	0	
	Both Positive	9	0	
	Negative	0	173	

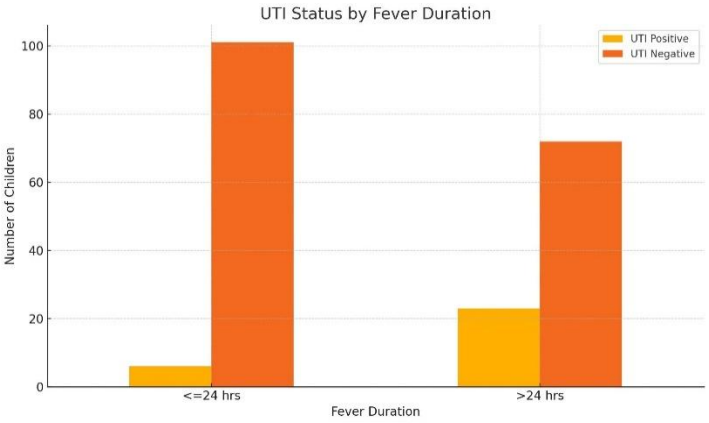

Figure 1 UTI Status by Fever Duration

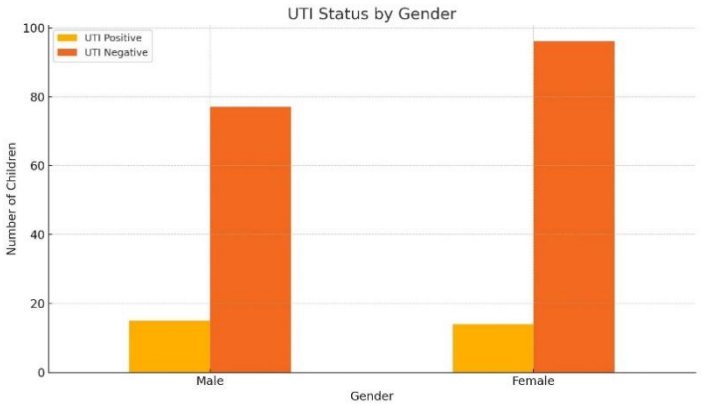

Figure 2 UTI Status by Gender

DISCUSSION

The findings of this study highlighted several important aspects regarding urinary tract infections in febrile children, some of which aligned with established literature while others diverged in meaningful ways. The overall UTI prevalence of 14.4% observed in this cohort was consistent with earlier findings that reported similar rates in children under two years of age presenting with high-grade fever. This reinforces the understanding of UTI as a common occult bacterial infection in febrile pediatric populations (14). However, the slightly lower prevalence in this study compared to others reporting rates as high as 37.5% could be attributed to stricter inclusion criteria, particularly the focus on fever without localized urinary symptoms, which likely excluded overt UTI cases (15). Age remained a significant determinant of infection risk, with 65.5% of UTIs occurring in children aged 1–3 years. This trend aligns with previously established age-related vulnerability, where infants and toddlers, particularly those under 13 months, were disproportionately affected (16,17). The decreasing prevalence in older children could be attributed to improved host defense mechanisms, including maturation of the immune system and better bladder control, reducing the likelihood of bacterial ascension and colonization.

Gender distribution revealed a near-equal burden of UTI between male and female children, with a slight male predominance observed. This trend has also been noted in prior studies, especially in younger male infants, where anatomical factors such as preputial colonization are thought to play a role in increased susceptibility (18). As age increases, the anatomical predisposition shifts in favor of females, largely due to the relatively shorter urethra, which facilitates easier pathogen entry. Fever duration emerged as one of the most clinically significant predictors in this study, with 79.3% of UTI-positive cases presenting after 24 hours of persistent fever. This supports findings from previous investigations which demonstrated higher UTI prevalence with prolonged fever, likely due to insufficient early immune clearance and progression from colonization to infection (19,20). Interestingly, despite the mean fever duration in this cohort being shorter than that observed in high-risk groups in earlier studies, the infection rate remained substantial, underscoring the potential importance of even moderate delays in clinical evaluation.

Clinical presentation in UTI-positive children was varied, with nearly half experiencing dysuria and a significant proportion reporting frequent urination. These findings align with previously reported symptomatology but also emphasize the diagnostic challenge in young, non-verbal children where fever may be the sole manifestation (21,22). The subtle and non-specific symptom profile increases the risk of missed diagnoses and unnecessary antibiotic exposure. The limited sensitivity of dipstick testing observed in this study further complicates the diagnostic pathway, echoing earlier warnings against relying solely on rapid urine screening methods in younger populations, where both false negatives and positives can distort clinical judgment (23). Sociodemographic factors such as parental education and employment, though rarely explored in earlier studies, were evaluated in this study and revealed that more than half of the parents were either unemployed or lacked formal education. While not statistically significant, such socioeconomic disadvantages may contribute to delayed healthcare-seeking behavior and increased vulnerability to complications from untreated infections. The inclusion of these variables adds depth to the findings and opens the door to broader social determinants of pediatric health that warrant further exploration.

This study carries several strengths, including a clearly defined febrile cohort, standardized urine collection protocols, and a focused evaluation of non-localizing febrile illness, thereby enhancing its clinical relevance. Additionally, the stratified analysis of demographic and clinical variables contributes to a more nuanced understanding of risk factors associated with pediatric UTIs. However, certain limitations must be acknowledged. The use of a single-center setting and non-probability sampling limits generalizability. The reliance on initial dipstick screening prior to culture may have missed culture-positive cases with negative screening, and the lack of follow-up data precludes an understanding of treatment outcomes or recurrence rates. Moreover, while the study attempted to evaluate predictors, logistic regression modeling was not employed, which could have provided a more robust analysis of independent risk factors. Future research should aim to include larger, multicenter cohorts and consider longitudinal designs to assess outcomes over time. Enhanced focus on diagnostic accuracy, particularly among non-verbal age groups, and the development of low-cost, reliable point-of-care tests are essential. Integrating socioeconomic and behavioral components may also offer valuable insights into barriers to early diagnosis and management in resource-limited settings.

CONCLUSION

In conclusion, this study highlights that urinary tract infection remains a clinically important cause of unexplained fever in young children, particularly when fever persists beyond a day. The findings underscore the need for timely urine testing in febrile pediatric patients without localized symptoms, as early identification can significantly reduce the risk of complications. By emphasizing the role of fever duration in predicting UTI, this study supports its integration into routine clinical assessment to guide more accurate and efficient diagnosis in pediatric care settings.

AUTHOR CONTRIBUTION

Author	Contribution
Zara Ibrar	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Ambreen Ahmad*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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Shabab Hussain	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Nazia Nijat	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ijaz Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ume Habiba	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Gul e Lala	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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