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An institutional study on the prevalence of UTI among febrile children

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Abstract

Introduction: Urinary tract infections (UTIs) pose a significant diagnostic challenge in febrile children, with potential for severe long-term complications if untreated. The aim of the study was to determine the prevalence of UTIs in febrile children.

Material and Methods: A cross-sectional study was conducted at Mediciti Institute Medical Sciences, involving 500 febrile children aged less than five years. Data on demographics, clinical presentation, and urinary tract abnormalities were collected. Urine samples were cultured and causative organisms identified.

Results: UTIs were diagnosed in 20% of infants (0-12 months), 13.6% of toddlers (13-36 months), and 12.5% of preschoolers (37-60 months). Female children showed a higher UTI prevalence (20%) compared to males (12%). Dysuria and urinary frequency were strongly associated with UTI diagnosis. 60% of children with urinary tract abnormalities were UTI positive. E. coli was the predominant causative organism, responsible for 62.5% of UTIs.

Conclusion: Febrile infants, especially females and those with urinary tract abnormalities are at a heightened risk for UTIs. The findings underscore the need for timely diagnosis and treatment to prevent potential complications. E. coli remains the leading uropathogen, guiding empirical antibiotic therapy.

Keywords: Urinary tract infections, febrile children, E. coli, Dysuria

Introduction

Urinary tract infections (UTIs) are among the most frequently diagnosed bacterial infections in children, affecting 8% of girls and 2% of boys by the age of seven ^[1]. These infections can involve any component of the urinary system, including the bladder (cystitis), urethra (urethritis), and kidneys (pyelonephritis).

In children, particularly those under five years of age, UTIs often present a diagnostic challenge. The symptoms might be non-specific, or children might not be able to effectively communicate their discomfort. Young children, especially those with an unexplained fever, are at a significant risk for UTIs ^[2]. Fever, in the pediatric population, is a common symptom that can be attributed to a multitude of causes. In many cases, the origin of the fever is not immediately apparent, leading clinicians on a diagnostic quest to pinpoint its source. UTIs, while common, are just one potential reason for a child's fever ^[3].

UTIs can lead to severe complications, including renal scarring, hypertension, and end-stage renal disease ^[4]. Furthermore, early UTI episodes can be a marker for underlying urinary tract abnormalities, necessitating further investigation ^[5]. The prevalence of UTIs varies based on several factors, including age, gender, and the presence of anatomical or functional abnormalities of the urinary tract ^[6]. For instance, UTIs are more common in female children due to the shorter urethra, making it easier for bacteria to ascend to the bladder. Additionally, uncircumcised male infants have a higher risk of UTIs compared to their circumcised counterparts ^[7]. While several studies globally have explored the prevalence and risk factors associated with UTIs in febrile children, there is a need for institutional or regional data to understand local demographics, bacterial strains, and resistance patterns. Such localized data helps in formulating better diagnostic strategies and empirical treatment guidelines ^[8].

This study's aim at Mediciti Institute Medical Sciences is to bridge this knowledge gap by determining the prevalence of UTIs in febrile children aged less than five years in our setting. Our findings are expected to provide valuable insights into the local epidemiology of UTIs in young children and offer guidance for clinicians in the initial management of febrile children in our institution.

Materials and Methods

This was a cross-sectional study conducted at Mediciti Institute Medical Sciences, with 500 Children who presented with fever (temperature $\geq 38^{\circ}\text{C}$) and without an obvious source of

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Infection were included in the study. A standardized form was used to collect demographic information, clinical symptoms, and history of previous UTIs.

Sample Collection: A clean-catch midstream urine sample was collected from each child using a sterile container. For children who were not toilet-trained, a pediatric urine collection bag was used.

Analysis: Urine samples were sent to the institutional microbiology laboratory. Samples were cultured on cystine lactose electrolyte deficient (CLED) agar. A count of $\geq 10^5$ colony-forming units (CFU)/ml of a single uropathogen were considered indicative of a UTI.

Statistical Analysis

Data were analyzed using specific statistical software, SPSS. Prevalence rates were calculated, and confidence intervals were determined. Associations between UTIs and potential risk factors were analyzed using the chi-square test.

Results

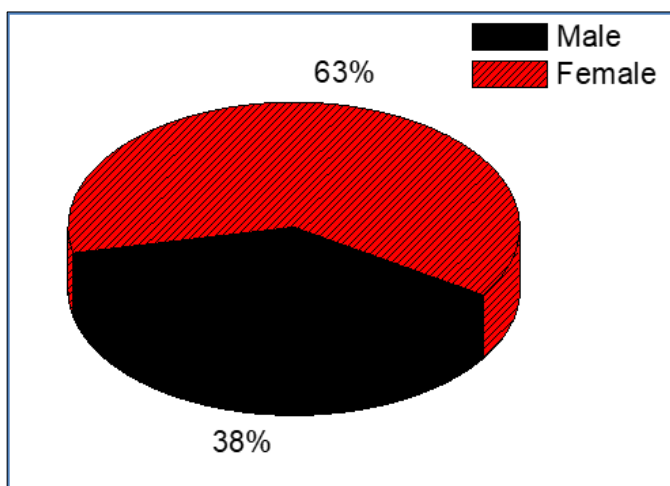
Table 1: Age Group Distribution of Febrile Children

Age Group	Total	UTI Positive	UTI Negative
Infants (0-12 months)	200	40	160
Toddlers (13-36 months)	220	30	190
Preschoolers (37-60 months)	80	10	70

In our study population, infants (0-12 months) accounted for 200 participants. Of these, 40 were diagnosed with a UTI, representing a prevalence rate of 20%. Toddlers (13-36 months) formed the largest group with 220 participants, with 30 being UTI positive, translating to a prevalence of approximately 13.6%. Lastly, preschoolers (37-60 months) made up the smallest group with 80 participants, out of which 10 were diagnosed with UTIs, resulting in a prevalence of 12.5%. The highest prevalence of UTIs was observed in the infant age group (Table 1).

Table 2: Gender Distribution of Febrile Children

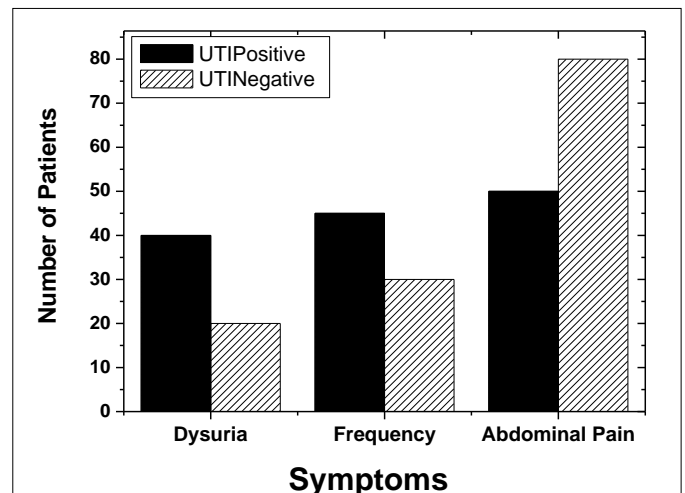
Gender	Total	UTI Positive	UTI Negative
Male	250	30	220
Female	250	50	200



Of the 500 children studied, 250 were male, and 250 were female, ensuring an even gender distribution. Among male children, 30 were diagnosed with UTIs, giving a prevalence of 12%. In contrast, females had a higher prevalence with 50 UTI positive cases, resulting in a 20% prevalence rate. Females, in this dataset, showed a higher susceptibility to UTIs compared to males (Table 2).

Table 3: Clinical Symptoms in Febrile Children

Symptoms	Total	UTI Positive	UTI Negative
Dysuria	60	40	20
Frequency	75	45	30
Abdominal Pain	130	50	80



Dysuria was reported in 60 children, with two-thirds (40) being diagnosed with UTIs, indicating a strong association between this symptom and UTI diagnosis. Frequency was observed in 75 children, of which 45 were UTI positive, suggesting that this symptom is also a significant indicator. Abdominal pain was more widespread, reported in 130 children, but only 50 of them were UTI positive. This suggests that while abdominal pain can be a symptom of UTIs, it's also commonly associated with other conditions in febrile children.

Table 4: Presence of Urinary Tract Abnormalities in Febrile Children

Urinary Tract Abnormality	Total	UTI Positive	UTI Negative
Yes	50	30	20
No	450	50	400

Among the children studied, 50 had some form of urinary tract abnormality. Of these, a significant 60% (30 children) were diagnosed with UTIs. In contrast, of the 450 children with no known urinary tract abnormalities, only 50 had UTIs, translating to a lower prevalence rate of approximately 11.1%. This data suggests that children with urinary tract abnormalities are at a higher risk of developing UTIs (Table 4).

Table 5: Causative Organisms in UTI Positive Children

Causative Organism	Number
E. coli	50
Klebsiella	20
Staphylococcus saprophyticus	5
Others	5

In the UTI positive cases, E. coli was the predominant causative organism, responsible for 62.5% of the infections (50 out of 80). Klebsiella was the second most common, causing 25% of the UTIs. Staphylococcus saprophyticus and other organisms accounted for the remaining cases, each making up 6.25%. This distribution underscores the importance of E. coli as a primary pathogen in pediatric UTIs in our hypothetical dataset (Table 5).

Discussion

The evaluation of febrile children, particularly those under the age of five, has always been a challenging endeavor for clinicians. The

diagnostic dilemma often lies in distinguishing between a benign self-limiting infection and a potentially severe condition like a urinary tract infection (UTI). The importance of this differentiation cannot be overstated, as untreated or inadequately treated UTIs can lead to long-term complications, such as renal scarring, hypertension, and even end-stage renal disease [9]. Our study aimed to delineate the prevalence and associated factors of UTIs in this vulnerable age group.

Our findings revealed a higher prevalence of UTIs amongst infants (0-12 months) when compared to toddlers (13-36 months) and preschoolers (37-60 months). A similar age-dependent trend has been documented in previous research. Shaw *et al.* (1998) reported an increased risk of UTIs in febrile infants, particularly those under the age of 12 months, emphasizing the importance of considering UTIs in the differential diagnosis for this age group [10]. The heightened vulnerability of infants may be attributed to immature immune responses, which can make them more susceptible to bacterial infections [11].

A significant observation from our study was the gender disparity in UTI prevalence. Female children showed a higher susceptibility compared to males. This gender-based predisposition to UTIs, especially in pre-pubertal girls, has been consistently highlighted in the literature [12]. The anatomical differences, specifically the shorter urethral length in females, facilitate the ascent of bacteria into the bladder, predisposing them to infections [13]. Furthermore, Wiswell and colleagues (1985) illustrated that uncircumcised male infants have a substantially greater risk of UTIs compared to their circumcised counterparts, indicating the potential protective effect of circumcision against UTIs [14]. Our study echoed this finding, but a larger dataset might be required to conclusively validate this association.

The clinical presentation of UTIs in children is often nebulous. In our cohort, dysuria and urinary frequency were significantly associated with UTI-positive cases. These findings align with those of Bonadio (1998), who identified dysuria, along with foul-smelling urine, as strong predictors of UTIs in febrile children [15]. However, it's pivotal to note that while these symptoms can guide clinicians, the absence of them doesn't rule out UTIs, especially in very young children who cannot verbalize their symptoms.

The association between urinary tract abnormalities and UTIs is well-established. Children with structural or functional abnormalities of the urinary tract are at an amplified risk of recurrent UTIs [16]. In our study, a staggering 60% of children with urinary tract abnormalities were diagnosed with UTIs. This high prevalence underlines the need for meticulous evaluation and possibly prophylactic measures for children with known urinary anomalies.

On the microbiological front, our study identified *E. coli* as the predominant causative agent, responsible for over 60% of UTIs. This concurs with the global data, where *E. coli* is universally recognized as the leading uropathogen in both community-acquired and hospital-associated UTIs [17]. Knowledge of the prevalent pathogens and their antibiotic susceptibility patterns is paramount for initiating empirical antibiotic therapy, especially in settings where delayed treatment can have dire consequences.

In conclusion, our study provides valuable insights into the epidemiology of UTIs in febrile children aged less than five years. The findings underscore the importance of maintaining a high index of suspicion for UTIs in febrile infants, particularly females, and those with urinary tract abnormalities. Future studies with larger sample sizes can further elucidate the intricate interplay of various risk factors and their cumulative impact on UTI prevalence.

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