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The Frequency of Urinary Tract Infections in Hospitalized Febrile Children at Vali-e-Asr Hospital in Qaemshahr in 2022

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ABSTRACT

Background: In many children, unexplained fever may be the sole indicator of a urinary tract infection (UTI). Given the importance of better understanding UTIs in children to prevent associated complications.

Objective: This study aimed to determine the prevalence of urinary tract infections among febrile hospitalized children in 2022.

Methods: This cross-sectional study was conducted on medical records of children aged 6 months to 13 years hospitalized due to fever at Vali-e-Asr Hospital in Qaemshahr. After obtaining the necessary permissions, demographic and other relevant data were extracted from the patient's medical records using a designed checklist. Additionally, urinalysis (U/A) was performed for all patients.

Results: A total of 208 febrile hospitalized children were examined, including 124 girls and 84 boys. Among these, 26 children (12.5%) were diagnosed with a UTI, of whom 24 were girls (92% of UTI cases) and 2 were boys. The mean age of children with UTIs was 7.5 years, with an average fever duration of approximately one day and a mean body temperature of 38°C. All patients tested positive for pyuria, and the majority exhibited bacteriuria. Associated symptoms included dysuria (22%), abdominal pain (33%), and vomiting (45%).

Conclusion: The findings indicate that accurate recognition of symptoms and their prevalence can assist healthcare professionals in promptly and accurately diagnosing UTIs in children. Identifying related factors can play a critical role in prevention and facilitate targeted care and periodic monitoring for children at risk of UTIs..

Key words: Fever, Urinary Tract Infection, Hospitalized children

INTRODUCTION

For many children, an unexplained fever may be the only indicator of a urinary tract infection (UTI). In some instances, children may exhibit additional symptoms with or without fever. In contrast, in other cases,

no symptoms may be present, particularly among infants and toddlers under two years of age. Research indicates that fever without a clear cause is the most common symptom of UTIs in children from birth to two years (1).

Girls are more susceptible to UTIs than boys due to their shorter urethra, which is anatomically closer to the anus. Additionally, uncircumcised boys have a higher incidence of UTIs compared to their circumcised counterparts. Approximately 8% of girls and 2% of boys experience at least one UTI during childhood, although before the age of one, UTIs are more prevalent in boys (2).

UTIs are defined by the presence of more than 100,000 colony-forming units (CFU) per milliliter in urine culture. However, clinical studies have demonstrated that UTIs can also occur with lower bacterial counts, such as fewer than 10^5 CFU/mL. While urine culture remains the gold standard for diagnosing UTIs, urinalysis is a simple, cost-effective, and accessible test that aids physicians in decision-making while awaiting culture results (3, 4).

UTIs can be classified into various categories, such as complicated versus uncomplicated, upper versus lower tract infections, and symptomatic versus asymptomatic infections. In children, UTIs are further divided into primary (first-time infections) and recurrent categories. Asymptomatic UTIs, which are often detected during screening, fall under the primary category. The prevalence of asymptomatic UTIs in school-aged children ranges from 0.01% to 0.07% (5, 6).

UTIs occur up to four times more frequently in adult women compared to men, and with increasing age, the prevalence of asymptomatic bacteriuria in older women may reach up to 50%. Among men over the age of 75, this prevalence ranges between 7% and 10%. UTIs may affect up to 10% of children during childhood, with uncircumcised boys under three months of age and girls under one year being at the highest risk (7).

Given that UTIs are a common source of fever without a specific focus on children, early diagnosis and prompt treatment are crucial to preventing kidney damage. Young children often present with nonspecific symptoms, such as fever, jaundice, vomiting, irritability, and growth delay, which necessitates particular attention (8).

Although advances in diagnostic and therapeutic methods have significantly reduced mortality associated with this disease, UTIs remain a major cause of kidney scarring, progressive renal damage, urinary stones, and hypertension. Screening children for asymptomatic bacteriuria is a critical step for preventing complications such as pyelonephritis and renal scarring (9).

Given the medical importance of UTIs in children, and recognizing that UTIs are among the most significant diagnoses related to unexplained fever, this study aimed to determine the prevalence of urinary tract infections in children hospitalized with fever.

Methods

This study was conducted as a cross-sectional investigation, focusing on the medical records of children aged 6 months to 13 years hospitalized for fever at Valiasr Hospital in Qaemshahr. The present study, categorized as descriptive-cross-sectional with an applied aim, utilized a census-based sampling method to select the population. A total of 208 medical records of children admitted with fever to Valiasr Hospital were examined. The inclusion criteria for this study comprised having a fever and an age between 6 months and 13 years. Records with incomplete data were excluded from the study.

Following the necessary approvals, demographic information and other relevant data were extracted and compiled from the patient's medical records by accessing the archives at Valiasr Hospital. A urinalysis (U/A) test was performed on all patients, and positive results for urinary tract infections were confirmed. The findings were analyzed and reported using SPSS version 26, employing descriptive statistical indices

(frequency and percentage) and analytical measures (mean and standard deviation). A p-value of less than 0.05 was considered as the threshold for statistical significance.

Results

In this study, the medical records of 208 children were reviewed, including 124 female children (59.3%) and 84 male children (40.2%). Among the 124 female children, 24 (19.3%) were diagnosed with UTIs, while 2 (2.3%) of the 84 male children were diagnosed with UTIs. Of the 26 children with UTIs, 24 (92.3%) were female and 2 (7.6%) were male (**Tables 1 and 2**). The results in **Table 3** show that among the 26 children with UTIs, 10 (37%) presented with fever one day, 9 (33.3%) presented with fever two days, and 7 (25.9%) presented with fever three days after the onset of fever. Statistical analysis revealed no significant relationship between the duration of fever onset and the frequency of UTIs (p=0.38).

Table1. Frequency of age groups of children hospitalized with fever by gender

Gender	Age	Number (%)
Female	0-3	24(19.4)
	3-6	27(21.8)
	6-9	52(41.9)
	9-13	21(16.9)
Male	0-3	15(17.9)
	3-6	22(26.2)
	6-9	34(40.5)
	9-13	13(15.5)

Table 2. Frequency of children hospitalized with fever and urinary tract infection by age group

Gender	Age	Number (%)
Female	0-3	5(20.8)
	3-6	2(8.3)
	6-9	12(50)
	9-13	5(20.8)
Male	0-3	1(50)
	3-6	1(50)
	6-9	0
	9-13	0

Table 3. Frequency and duration of fever in children hospitalized with fever

Group	Days	Number (%)
Children hospitalized with	1	118(56.7)
	2	55(26.4)

fever	<3	35(16.8)
Children hospitalized with fever and urinary tract infection	1	10(38.5)
	2	9(34.6)
	<3	7(26.9)

According to the results presented in **Table 4**, the highest percentage of fever degree was between 38.5–38°C, which included 92 out of the 208 children. Among the children diagnosed with UTIs, the highest percentage of fever degree also fell between 38.5–38°C, which accounted for 40% of all children with UTIs. There was no significant association between the degree of fever and the frequency of UTIs in febrile children (p=0.81).

Table 4. Frequency of fever grade in children hospitalized with fever

Group	Days	Number (%)
Children hospitalized with fever	38-38.4	92(44.2)
	38.4-38.9	46(22.1)
	39-39.4	42(20.2)
	39.5<	28(13.5)
Children hospitalized with fever and urinary tract infection	38-38.4	11(42.3)
	38.4-38.9	6(23.1)
	39-39.4	5(19.2)
	39.5<	4(15.4)

In this study, pyuria (the presence of white blood cells in urine) was positive in 44 children (21.2%), of whom 26 (59.09%) were diagnosed with UTIs. All children with UTIs had positive pyuria results (**Table 5**). The results indicated a significant relationship between pyuria and the frequency of UTIs in febrile children (p<0.001). Additionally, the study revealed no significant association between the presence of nitrites in urine and the frequency of UTIs (p=0.19).

Table 5. Prevalence of pyuria in children hospitalized with fever

Group	Pyuria	Number (%)	Nitrite	Number (%)
Children hospitalized with fever	+	44(21.2)	+	7(3.4)
	-	164(78.8)	-	201(96.6)

Children hospitalized with fever and urinary tract infection	+	26(100)	+	2(7.7)
	-	0	-	24(92.3)

Table 6 shows that 177 children (85.1%) were negative for bacteriuria, while 2 (7.7%) of the 26 children with UTIs were negative for bacteriuria. These results indicate a significant relationship between bacteriuria and the frequency of UTIs in febrile children ($p<0.001$). The most common associated symptom was vomiting, observed in 94 children (45%), followed by abdominal pain in 80 children (38.3%) and dysuria in 34 children (16.3%). Among the 26 children with UTIs, 11 (40.7%) had vomiting, 9 (33.3%) had abdominal pain, and 6 (22.2%) had dysuria (**Table 7**). There was no significant association between associated symptoms and the frequency of UTIs in febrile children ($p=0.53$).

Table 6. Frequency of bacteriuria in children hospitalized with fever

Group	**Days**	**Number (%)**
Children hospitalized with fever	negative	177(85.1)
	rare	12(5.8)
	few	14(6.7)
	moderate	5(2.4)
Children hospitalized with fever and urinary tract infection	negative	2(7.7)
	rare	9(34.6)
	few	10(38.5)
	moderate	5(19.2)

Table 7. Frequency of accompanying symptoms in children hospitalized with fever

Group	**Days**	**Number (%)**
Children hospitalized with fever	heartburn	34(16.3)
	abdominal pain	80(38.5)
	vomiting	94(45.2)
Children hospitalized with fever and urinary tract infection	heartburn	6(23.1)
	abdominal pain	9(34.6)
	vomiting	11(42.3)

Discussion

This retrospective study reviewed the medical records of children admitted to the pediatric ward of Vali Asr Hospital in Qaemshahr in 2022. In the current study, the majority of patients with UTIs were female (92%), which is consistent with the findings of studies by Safaei Del (female 83%, male 17%) and Mohammad Akram (female 66%, male 34%) (10, 11). Additionally, a study conducted in Belgium in 2011 by Khaled et al. investigated fever-associated urinary tract infections in children. This study included 209 children with unexplained fever, revealing that 63% of the patients were female and 37% were male (12). Moreover, Philip Mason's research indicated that the number of girls with urinary tract infections is approximately four times higher than that of boys, and the incidence in girls is greater (13). Williams' studies also highlighted that one of the key factors contributing to urinary tract infections in children is female gender (14).

According to the tables and results of the tests, a significant association was found between the frequency of UTIs and gender ($p<0.001$). The results of the current study align with those mentioned above, demonstrating that girls are a high-risk group. The highest proportion of patients with UTIs in this study was in the age group of 6 to 9 years (41.1%), followed by 3 to 6 years (23.4%) and 0 to 3 years (18.7%). In the study by Mohammad Reza Sharif and et al, 30% of patients were in the under-one-year age group, and 28% were in the group older than five years (15). This finding reflects the higher incidence of UTIs leading to hospitalization at younger ages, which, given the ambiguous symptoms in these age groups and the high potential for kidney tissue damage, underscores the importance of early diagnosis of UTIs in young children. No significant association was found between the frequency of UTIs and age ($p=0.63$), which is consistent with the findings of Sharif et al.

Pyuria was the most common finding from urinalysis in individuals with UTIs in this study, observed in 100% of the urine samples. Following that, bacteriuria and nitrites were the next most frequent findings. The results from studies by Penny et al. also indicated the accuracy of pyuria, bacteriuria, and nitrites in diagnosing UTIs (16), which is consistent with the results of pyuria and bacteriuria in this study. However, the results regarding nitrites do not align with those of the current study, which may be due to inaccuracies in the hospital's laboratory. According to the tables and the results of the statistical tests, a significant association was found between the frequency of UTIs and pyuria and bacteriuria ($p<0.001$), but no significant association was found with nitrites in the urine ($p=0.19$).

Additionally, the results of the study showed that there was no significant association between the degree of fever ($p=0.81$), the time of fever onset ($p=0.38$), and the associated symptoms ($p=0.53$) with the frequency of UTIs. These findings are consistent with the study by Seyed Abolhasan Seyedzadeh et al, which was conducted in Iran on children hospitalized at Razi Hospital in Kermanshah.

Conclusion

UTIs in children, particularly infants, present with a variety of symptoms that are sometimes ambiguous and confusing. Therefore, a thorough understanding of the symptoms and the prevalence of each can greatly assist physicians in the accurate and timely diagnosis of UTIs. Given that UTIs are a significant factor in causing irreparable kidney damage in children and can lead to severe complications if not diagnosed and treated promptly, identifying associated risk factors can be pivotal in preventing the occurrence of such infections. Furthermore, recognizing these factors can lead to enhanced preventive measures and necessary precautions for children at high risk, as well as periodic evaluations to prevent UTIs. Additionally, this awareness can inform healthcare professionals that, due to the insufficient diagnostic value of pyuria or bacteriuria alone, more comprehensive investigations, such as urine culture, should be conducted for children at risk of UTIs. Finally, raising awareness and providing sufficient education on maintaining proper hygiene in girls, considering the higher incidence of UTIs in this group compared to males is essential for

reducing the prevalence of urinary tract infections in females.

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