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Original Article

Complications and Clinical Manifestations of Febrile Urinary Tract Infections in Children — A Case-Control Study

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ABSTRACT

Introduction: *Urinary tract infections (UTIs) are one of the most common infections in children, particularly in those presenting with fever. Febrile UTIs, if left untreated or poorly managed, can lead to significant morbidity, including kidney damage. This study aims to investigate the clinical manifestations and complications of febrile UTIs in children aged 5–12 years.* ***Methods & Materials:*** *This case-control study was conducted at the Department of Paediatrics, Comilla Medical College Hospital, Comilla, from January 2013 to July 2013. A total of 50 cases and 50 suitably matched controls were enrolled by systematic random sampling technique. Data were processed and analyzed using computer software and SPSS.* ***Result:*** *This study found that febrile urinary tract infections (UTIs) in children were characterized with fever present in 100% of cases, abdominal pain in 90%, and frequency of micturition in 72%. Urine analysis revealed abnormal results (PUS cells >5) in all 50 cases (100%), while bacterial growth was found in 23 (46%) cases. Imaging studies identified structural abnormalities in 8 (16%) of the cases. The study also reported a variety of complications, including dysuria in 30 (60%), poor feeding in 35 (70%), irritability in 9 (18%), and tenderness in the renal angle (36%) and suprapubic region (38%).* ***Conclusion:*** *Fever and abdominal pain were the most common symptoms, with dysuria, frequent urination, and poor feeding also reported. Urine tests confirmed infection, and imaging revealed structural abnormalities in some cases. Early diagnosis with clinical evaluation, urine tests, and imaging is crucial to prevent renal damage.*

Keywords: *Urinary tract infection, Complications, Clinical manifestations, Urine R/E, Ultrasound*

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INTRODUCTION

Febrile urinary tract infections (UTIs) in children are a significant cause of morbidity and healthcare visits, and they remain one of the most common infections in pediatric populations. The incidence of UTIs in children is often under-recognized, with clinical manifestations varying based on age and underlying conditions. The most prevalent pathogens involved in UTIs are *Escherichia coli* (E. coli), though other microorganisms, such as Klebsiella pneumoniae and Enterococcus faecalis, are also implicated [1]. In the pediatric population, UTIs are more common in girls, but boys under the age of one year also experience higher rates of infection [2]. Symptoms of febrile UTI in children often include fever, dysuria, abdominal pain, frequency of urination, and irritability [3]. However, these symptoms can overlap with those of other common childhood illnesses, which can delay diagnosis and treatment. Fever is a hallmark symptom of a febrile UTI, and its presence often necessitates the evaluation of other associated symptoms and diagnostic tests, including urine analysis and culture. In the clinical setting, urine analysis, particularly the presence of white blood cells (pus cells), and urine culture to identify bacterial growth are critical diagnostic tools in confirming UTIs [4]. Studies have shown that children presenting with fever and abnormal urine analysis results are more likely to have UTIs, and urine culture remains the gold standard for confirming bacterial growth and determining appropriate antibiotic therapy [5]. Moreover, ultrasonography of the kidneys, ureters, and bladder (KUB) is often used to assess for structural abnormalities or complications such as renal scarring, which can result from untreated or recurrent infections [6]. The complications associated with febrile UTIs in children can be serious and include renal scarring, recurrent infections, and, in severe cases, sepsis. Renal scarring, a common complication, has been associated with recurrent UTIs, particularly in children who experience delays in diagnosis or treatment [7]. Scarring can lead to hypertension, impaired renal function, and chronic kidney disease later in life. The risk of renal scarring is particularly high in young children and infants, and studies suggest that early treatment of UTIs may reduce this risk significantly [8]. Furthermore, febrile UTIs can lead to systemic

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complications, such as sepsis, if bacteria spread from the kidneys to the bloodstream [9]. The clinical signs of sepsis in children may be subtle, including irritability, poor feeding, and fever, and can easily be mistaken for other conditions if not carefully monitored. The clinical manifestations of UTIs in children can vary based on their age and ability to communicate their symptoms. In younger children, fever, irritability, and poor feeding are more commonly observed, while older children may present with more classic symptoms such as dysuria, frequency of urination, and lower abdominal pain [10]. The presence of fever, particularly when accompanied by symptoms such as dysuria or frequency of urination, should raise suspicion for UTI and prompt further investigation. The management of febrile UTIs involves the appropriate use of antibiotics based on urine culture results and the clinical severity of the infection. Antibiotic resistance is a growing concern in the treatment of UTIs, making the identification of the causative pathogen and its susceptibility profile increasingly important for effective treatment [11]. The study described here aims to investigate the clinical manifestations and complications of febrile UTIs in children aged 5–12 years.

METHODS & MATERIALS

This case-control study was conducted at the Department of Paediatrics, Comilla Medical College Hospital, Comilla, from January 2013 to July 2013. All children aged from 5 years to 12 years irrespective of sex who attended the Department of Pediatrics at Comilla Medical College Hospital, Comilla, fulfilling the inclusion and exclusion criteria, and their mothers were enrolled in this study. A total of 50 cases and 50 suitably matched controls were enrolled by systematic random sampling technique. Detailed history and physical examination of the baby was done and febrile urinary tract infection was diagnosed clinically and by urine analysis. Patients with symptoms of fever, dysuria, frequency of micturition, abdominal pain, nausea, vomiting, poor feeding, and irritability. Malodourous urine, incontinence, and chills were taken as history, and on physical examination raised temperature, tender suprapubic region, and tender renal angle were taken as signs. On urine analysis 4-6 pus cells per high power field were taken as febrile urinary tract infection. Culture-sensitivity and USG of the KUB region were done when needed. Every case satisfying the selection criteria was enrolled in the study. Babies admitted for other diseases in the pediatrics ward were included as controls. Data were processed and analyzed using computer software and SPSS. The significance of the difference was calculated by using, the chi-square test. Multi-nominal regression analysis was also carried out. Informed written consent of parents/guardians of each patient was taken.

Inclusion criteria:

- Age of children from 5 years to 12 years
- Children who gave a history of fever, dysuria abdominal pain, and frequency of micturition
- Children who were able to give urine samples aseptically.

Exclusion criteria:

- Children of less than 5 years and more than 12 years
- Non-co-operative patients.
- Children who were unable to give urine samples.
- Children who had other causes of fever.
- Children who had other causes of abdominal pain.

RESULTS

Table – I: Baseline characteristics of study subjects (*n*=100)

Baseline characteristics	Group		P value
	Case (n=50)	Control (n=50)	
Age(years)	7.5±2.2	7.7±2.3	0.724
Sex			
Male	22(44.0)	34(68.0)	0.020
Female	28(56.0)	16(32.0)	
Male: Female	22:28	34:16	
Socio economic status			
Poor class	35(70.0)	36(72.0)	0.939
Middle class	9(18.0)	10(20.0)	
Upper class	6(12.0)	4(8.0)	

Table I shows the baseline characteristics of the study subjects in two groups. The mean (SD) age of cases and control were 7.4 (2.2) years and 7.7 (2.3) years respectively. In the case group, males and females were 22 (44.0%) cases and 28 (56.0%) cases respectively, and in the control group, males and females were 34 (68.0%) cases and 16 (32.0%) cases respectively. The difference was statistically significant ($p<0.05$). Most of the study subjects 35 (70.0%) in the case and 36 (72.0%) in control were poor. The difference was not statistically significant ($p>0.05$).

Table – II: Urine R/E among study subjects in groups (*n*=100)

Urine R/E	Group		P value
	Case (n=50)	Control (n=50)	
Normal	0(0.0)	50(100.0)	0.001
Abnormal (PUS cell>5)	50(100.0)	0(0.0)	
Total	50(100.0)	50(100.0)	

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Table II shows urine R/E among the study subjects. In the case group, all of the patients' 50(100.0%) urine R/E was found abnormal.

Table – III: Urine C/S among study subjects in groups (*n*=100)

Urine R/E	Group		P value
	Case (n=50)	Control (n=50)	
Normal*	27(54.0)	50(100.0)	0.001
Growth	23(46.0)	0(0.0)	
Total	50(100.0)	50(100.0)	

Table III shows urine C/S among the study subjects. There was growth of bacteria in 23(46.0) patients in group A.
*According to Nelson's definition of UTI

Table – IV: USG of KUB among study subjects in the group (*n*=100)

USG of KUB	Group		P value
	Case (n=50)	Control (n=50)	
Normal*	42(84.0)	50(100.0)	0.006
Abnormal*	8(16.0)	0(0.0)	
Total	50(100.0)	50(100.0)	

Table IV shows the USG of KUB among the study subjects. Abnormality was found in 8 (16.0) cases in the case group.
*Any structural anomalies or other defects.

Table – V: Complications of the study subjects in case groups (*n*=50)

Complaints	Frequency	Percentage
Dysuria	30	(60.0)
Frequency of micturition	36	(72.0)
Abdominal pain	45	(90.0)
Nausea	21	(42.0)
Vomiting	21	(42.0)
Poor feeding	35	(70.0)
Irritability	9	(18.0)
Mal-odour urine	10	(20.0)
Incontinence	18	(36.0)
Chills	6	(12.0)
Tender renal angle	18	(36.0)
Tender suprapubic region	19	(38.0)
Fever	50	(100.0)

Table V shows that fever was present in all patients (100%), followed by abdominal pain (90%), frequency of micturition (72%), and poor feeding (70%). Other common symptoms included dysuria (60%), irritability (18%), and nausea/vomiting (42%). A variety of other symptoms were reported, such as malodorous urine (20%), incontinence (36%), and tenderness in the renal angle (36%) and suprapubic region (38%).

DISCUSSION

Urinary tract infections (UTIs) are a significant cause of morbidity in pediatric patients, with clinical presentations ranging from asymptomatic bacteriuria to severe febrile illness. This study analyzed various parameters, including baseline characteristics, urine analysis, imaging findings, and complications in pediatric cases with UTIs, compared to controls. The mean age of the cases and controls was comparable, with no statistically significant difference (p>0.05). However, a significant difference was observed in the sex distribution, with more males in the control group (68%) and more females in the case group (56%) (p=0.020). This sex-based difference is consistent with existing literature, where females are more prone to UTIs due to shorter urethras and proximity to the perineal flora [12,13]. Urine R/E revealed abnormal findings (PUS cells >5) in all cases, while none of the controls had abnormal results, with a statistically significant difference (p=0.001). This finding underscores the importance of urine microscopy as a primary diagnostic tool in suspected UTI cases [14]. Additionally, urine culture demonstrated bacterial growth in 46% of cases, a hallmark for confirming UTI diagnosis, compared to no growth in controls (p=0.001). These findings align with other studies [15]. The prevalence of positive cultures, although slightly lower than reported in some studies, can vary due to differences in specimen

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collection methods, age, and regional microbiological profiles [16,17]. Ultrasound of the kidneys, ureters, and bladder (USG-KUB) revealed structural abnormalities in 16% of cases, while controls showed no abnormalities (p=0.006). This result highlights the role of imaging in identifying anatomical contributors to UTIs, such as vesicoureteral reflux or obstructive uropathy, which are common underlying causes in pediatric populations [18]. Early identification of structural anomalies is critical for preventing recurrent infections and potential renal damage [19]. The clinical spectrum of UTIs observed in this study was diverse. Fever was universally present in all cases, followed by abdominal pain (90%), frequency of micturition (72%), and poor feeding (70%). These findings align with prior studies indicating that fever and abdominal pain are predominant symptoms in pediatric UTIs [20]. Dysuria (60%), nausea, vomiting (42%), and incontinence (36%) were also commonly reported. Symptoms such as suprapubic tenderness (38%), renal angle tenderness (36%), and malodorous urine (20%) were less frequent but significant, particularly in diagnosing complicated UTIs [21]. Chills and irritability were observed in 12% and 18% of cases, respectively, indicating systemic involvement in severe cases. These findings emphasize the need for comprehensive clinical evaluation, as symptoms may vary based on age, sex, and infection severity [14]. This study highlights the importance of early diagnosis and management of UTIs in pediatric populations. Urine R/E and culture remain the cornerstones of diagnosis, complemented by imaging studies in cases with recurrent infections or abnormal urine analysis. Structural abnormalities detected by USG-KUB in 16% of cases warrant further investigation, as early intervention can prevent complications such as renal scarring and chronic kidney disease [22].

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This case-control study highlights the significant clinical burden and complications associated with febrile urinary tract infections (UTIs) in children. Fever and abdominal pain were the most prevalent symptoms, alongside other manifestations such as dysuria, frequency of micturition, and poor feeding. Urine analysis and culture-confirmed infection in all cases, with imaging identifying structural abnormalities in a subset of patients. The findings emphasize the importance of early diagnosis through clinical evaluation, urine testing, and imaging to prevent long-term complications such as renal damage.

RECOMMENDATION

It is recommended that clinicians maintain a high index of suspicion for febrile urinary tract infections (UTIs) in children presenting with fever, abdominal pain, or urinary symptoms. Routine urine analysis and culture should be performed in suspected cases to confirm the diagnosis, and imaging studies like USG-KUB should be utilized to detect potential structural abnormalities. Early and targeted treatment is essential to prevent complications such as renal scarring.

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