

Evaluation of Urinary Tract Infection in Children With Gastroenteritis

Gholamreza Soleimani,¹ Simin Sadeghi Bojd,^{1,*} Alireza Teimouri,¹ Elham Shafighi Shahri,² and Elham Karbasy Dehujy³

¹Children and Adolescent Health Research Center, Zahedan University of Medical Sciences, Zahedan, IR Iran

²Zahedan University of Medical Sciences, Zahedan, IR Iran

³Faculty of Medicine, Zahedan University of Medical Sciences, Zahedan, IR Iran

*Corresponding author: Simin Sadeghi Bojd, Children and Adolescent Health Research Center, Zahedan University of Medical Sciences, Zahedan, IR Iran, E-mail: sisadegh@yahoo.com

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Abstract

Background: Urinary tract infection (UTI) is the second most common bacterial infection in infancy and childhood with peaking in infancy and toilet training.

Objectives: The current study aimed to investigate UTI in patients with diarrhea.

Patients and Methods: This case-control study was conducted on 200 participants, 100 were patients with acute gastroenteritis and the other 100 were controls who referred to the clinic for routine checkup. UTI was defined as two positive urine cultures with $> 10^5$ cfu/mL. If white blood cells were more than $10/\text{mm}^3$ in un-centrifuged urine it would be considered pyuria and more than one microorganism in 10 oil immersion fields as bacteriuria. Analysis was conducted using SPSS ver. 16 with application of chi-square test and 0.05 as significant levels.

Results: The distribution of these 200 children were 115 (57.5%) and 85 (42.5%) for females and males respectively. The gender and age distribution in case and control groups showed non-significant association. In urine culture it was observed that 27 individuals were positive and there were seven healthy children. The number of children with positive urine culture was higher than that of their counterparts significantly ($P = 0.0001$). Relationship between urine culture and age groups showed that the number of participants with positive urine culture was higher in children with age of two months to two years but it was not significant ($P = 0.54$).

Conclusions: It was demonstrated that, considerable percentage of UTI existed in the gastroenteritis diseases. Early treatment of UTI in patients would reduce UTI complications.

Keywords: Urinary Tract Infection, Gastroenteritis, Children

1. Background

Urinary tract infection (UTI) is the second most common bacterial infection in infants and children with a peak for infants especially in toilet training period. A prevalence of 3% - 7% is reported in children younger than two years, while it is presenting in emergency departments (ED) with a febrile illness (1). Seven percent of females and two percent of males have positive symptomatic of UTI culture up to the age of six years. Below the age of one year, urinary tract infection occurs more frequently in males than in females; however, after the age of one year, UTI is more common in females (1, 2). Since it is difficult to diagnose UTI in young children many cases are probably be missed. The challenge is that young children with UTI often present non-specific symptoms and do not usually pertain to the genitourinary tract that is also present in non-specific illness. Clinicians may therefore not consider a urine sample in diagnosis (3, 4). *Escherichia coli* cause 75% to 90% of UTI infections and morbidities due to relevant infection; there-

fore, it is necessary to pay more attention in primary care to children (5). Along with all the mentioned symptoms, another common symptom for many diseases in infants and children is diarrhea. Diarrhea as a symptom is likely to be presented in UTI (1, 2). In case of pyelonephritis, the clinical findings may include varied gastrointestinal symptoms such as diarrhea, vomiting and nausea which may confound the diagnosis of UTI (1).

2. Objectives

Considering the aforementioned subjects and existence of no investigation about UTI and diarrhea association so far, authors aimed to investigate presenting UTI in children with diarrhea.

3. Patients and Methods

This case-control study was performed on 200 participants among which 100 were patients with acute gastroen-

teritis and the other 100 were the controls who referred to the clinic of nephrology and infectious for treatment and routine checkup respectively in Ali-Asghar hospital, Tehran, Iran. All participants age ranged from two months to five years and they were collected considering matching age, gender and many known UTI risk factors such as labial adhesion and circumcision. All participants had no previous history of UTI. Data collection started after approval of the ethic committee: considering a number of ethical standards and obtaining signed letter of consent form the parents. The urine samples were obtained from children less than two years using catheter and for the others (with toilet tanning control) the midstream method was applied. Urine analysis was performed for all patients and shifted to an environment with four centigrade celcius and for suspicious samples was repeated one more time. Participants were classified according to the gender and age groups. Interpretation of culture results depends on the method of urine collection, the Kass criteria are still used for midstream voided: the cutoff level is 100,000 cfu/mL. By suprapubic aspiration, any growth is considered significant. In catheterized samples, the cutoff level suggested by Bensman and Tim Ulinsk (1), is 50,000 colonies firming unit (CFU). UTI was defined as two positive urine cultures with $> 10^5$ cfu/mL. If white blood cells were more than $10/\text{mm}^3$ in UN centrifuged urine, it is considered pyuria and more than one microorganism in 10 oil immersion fields as bacteriuria (2, 3). Exclusion criteria were oral or intravenous consumption of antibiotics 48 hours before referring to the physician, and chronic diarrhea in children more two weeks, bladder extrophy, colostomy, renal disease and malnutrition. The SPSS ver.16 was applied for data analysis employing Chi-square test and 0.05 as the level of significance.

4. Results

In the total 200 children entered to the study, the gender distribution of participants was 115 (57.5%) and 85(42.5%) for females and males respectively. This trend was 61 females and 39 males in the cases and 54 females and 46 males in control group. Primary analysis showed non-significant differences between case and control groups considering age and gender ($P > 0.05$) (Tables 1 and 2).

Table 3 showed the results related to urine culture in participants, it was observed that 27 individuals in the case group had positive urine culture and there were seven children in the control group with positive urine culture. Chi-square results showed that the number of children affected by positive urine culture was significantly higher in the case group than the control one ($P = 0.0001$).

Table 1. Gender Distribution of Participants in the Case and Control Groups

Groups	Gender, No (%)		P Value
	Male	Female	
Case	39 (39)	61 (61)	0.39
Control	46 (46)	54 (54)	
All	85 (42.5)	115 (57.5)	

Table 2. Age Distribution of participants in the Case and Control Groups

Groups	Age, No. (%)		P Value
	Two Months - Two Years	Two - Five Years	
Case	58 (58)	42 (42)	0.47
Control	63 (63)	37 (37)	
All	121 (60.5)	79 (39.5)	

Table 3. Urine Culture in Participants

Participants	Urine Culture		P Value
	Negative	Positive	
Case	73	27	0.0001
Control	93	7	
All	166	34	

Table 4 showed that the frequency of participants who had positive urine culture was greater in the age group of two months to two years, but the difference compared to the control group was insignificant ($P = 0.54$).

5. Discussion

The present study aimed to evaluate the relationship between gastroenteritis and UTI in participants referred to the infectious and nephrology ward in Ali-ebne-Abitaleb hospital in Zahedan, Iran. Children who entered the study were matched according to gender and age in the case and control groups. The number of children affected by positive urine culture was significantly higher in the case group compared to their counterparts in the control group. Symptoms of UTI in young children tend to be non-specific. If UTI is not suspected or there is difficulty obtaining a sample, the diagnosis will be missed. O'Brien (4, 5) proved that the prevalence of UTI was two in one-hundred in children older than three years without increased urinary frequency or dysuria. Urine sampling based purely on GP suspicion would miss 80% of UTI, while a sampling strategy based on current guidelines would miss 50%. This

Table 4. Frequency Distribution in Participants Based on Specific Age Groups

Age	Urine Culture			P Value
	Negative	Positive	Total	
From 2 months - 2 years	102	19	121	0.54
Between 2 - 5 year	64	15	79	
Total	166	34	200	

is particularly in primary care where children frequently consult with non-specific symptoms and where appropriate pediatric equipment is not always available. In another study by O' Brien, a total of 116 children aged under five were invited to participate. The median age was 20 months and the most common presenting symptom was nasal congestion (present in 77%), followed by cough (75%) and fever (69%). Non-specific constitutional symptoms, e.g, irritability, clinginess, crying more than usual, tiredness, poor sleep, and poor appetite were present in over 50% of the children. Specific urinary symptoms were uncommon (6). The current study found a prevalence of 27% for UTI in children with diarrhea, but in other studies it was 12.1% in hospitalized patients in the first time of having UTI and the prevalence of gastroenteritis in association with UTI was 8.1% (7).

In addition, Ayazi et al. (8) conducted a study in this area and reported 23% and 26.9% for diarrhea and vomiting, respectively. Fallahzadeh et al. (9) also conducted a study on the relationship between diarrhea and UTI and concluded that the incidence of UTI in patients with diarrhea was significantly higher compared with those of the controls. The incidence of UTI in the case and control groups was 6.7% and 0.8% respectively in the study by fallahzadeh. Duration of diarrhea was not a predictive of the presence of UTI in this study which was similar to the current study findings. Alexander reported that UTI due to *Salmonella* spp. infection in patients without a predisposing condition was uncommon and accounted for only 0.63% of all UTI cases caused by *Salmonella* spp., while the patients in the current study were affected by other agents (10). Thakar et al. (11) reported that out of 100 children with diarrhea, 51 were males and 49 females and 8% had pathogenic organisms grown in supra pubic urine culture that was less than the current study results. This low amount may be due to the fact that urine sampling is the most reliable method. Among gender, recurrent diarrhea, fever, severe dehydration, severe malnutrition and invasive stools that are emerged as significant risk factors, multivariate analysis revealed that only two factors of invasive diarrhea and degree of dehydration tent to have significant effect. In addition to the importance of UTI infec-

tion and the compliances, it can be showed that UTI is a gastroenteritis manifestation (11, 12). The study was conducted on the frequency of UTI in gastroenteritis infection in children to diagnose and treat appropriately and reduce the complications. Accordance to the current study findings, positive urine cultures in the two groups were significantly different. In a retrospective study of UTI among 54 pediatric patients in a tertiary hospital, the striking finding was that UTI seldom existed as a single condition. In 86% of the cases, UTI was a part of the other common diseases such that gastroenteritis (in 35% of UTI patients), protein energy malnutrition (43%) and acute respiratory infection (24%) (13). Ibeneme et al. (14) performed a valuable study on 200 children with febrile and concluded that the prevalence of UTI was significantly higher in females than in males ($P = 0.049$). The common clinical features were vomiting (13.11%), abdominal pain (9.25%), diarrhea (11.76%), urinary frequency and urgency but none had a significant association with UTI. Out of the 22 children with gastroenteritis, only one had UTI (6.25%) and in comparison these results were less than the current study findings. Ashok conducted a comprehensive study on clinical profile of children with UTI aged from three to six years and found that 14 (70%) cases had a diagnosis other than UTI such as gastroenteritis and respiratory infection. Of the 80 cases with gastroenteritis 5 (5%) patients had UTI (15). Similar to the current study, Ashok's showed that UTI would be missed if urine culture not taken as a routine diagnostic method of evaluation. The current study findings also revealed that most of the participants with positive urine culture were in the age group ranged from two months to two years with no significant difference compared to those of the control group. Balat and Leighton (7) reported similarly that most of the patients with concomitant infectious disease were less than one year. It could be due to the immunologic status of these patients and their susceptibility to infections which was explained by the higher rate of concomitant disease in this age group. In the current study, 19 subjects with UTI were female (70.37%) when reported that the prevalence of UTI in females with diarrhea was 14.2% in contrast to only 1.9% in males that emphasizes female gender as a risk factor for UTI (10). In other studies, female patients

had higher risk of UTI (10.7%) which was statistically significant ($P < 0.05$) (15). Heavy periurethral colonization is often associated with perineal contamination in gastroenteritis that may describe the higher prevalence in females. UTI should be suspected in patients with fever with no apparent source and in females with gastroenteritis; hence urine culture should be checked routinely in such patients when UTI is suspected (15). It is recommended that clinicians should consider UTI in children with febrile under the age of five years and urine culture should be obtained as a part of the diagnostic evaluation in such children. Follow-up assessment to confirm an appropriate clinical response should be performed 48 to 72 hours after initiating antimicrobial therapy in all children with UTI. Culture and susceptibility results may indicate that a change of antibiotic is necessary. Referral to a subspecialist is recommended if vesicoureteral reflux, renal scarring, anatomic abnormalities, or renal calculi are discovered or if invasive imaging procedures were considered (13).

5.1. Conclusion

The current study demonstrated considerable rate of UTI in the gastroenteritis diseases. Early treatment of UTI in patients with gastroenteritis diseases would reduce UTI complications.

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Footnote

Authors' Contribution: Study concept and design: Simin Sadeghi; acquisition of data: Elham Karbasi; analysis and interpretation of data: Gholamreza Soleimani; drafting of the manuscript: Elham Shafighi Shahri; critical revision of the manuscript for important intellectual content: Simin Sadeghi, Gholamreza Soleimani; statistical analysis: Alireza Teimouri; study supervision: Simin Sadeghi.

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