

Short communication

Urinary tract infection in infants and children with diarrhoea

M.H. Fallahzadeh¹ and F. Ghane²

عدوى المسالك البولية لدى الأطفال والرضع المصابين بالإسهال

محمد حسين فلاح زاده، فاطمة قانع

الخلاصة: قام الباحثان بدراسة على 120 مريضاً و120 شاهداً صحيحاً من نفس السن ومن نفس الجنس، تتراوح أعمارهم بين 4 أسابيع و5 سنوات، لتحديد متى يجب الفحص عن عدوى المسالك البولية لدى الأطفال المصابين بالإسهال. وقد تم تكرار المزارع البولية للبيئة القياسية والبيئة الجرثومية للأطفال المشكوك في مزارعهم البولية أو الإيجابي النتائج. وقد اكتشفت عدوى المسالك البولية لدى 8 مريضات (جميعهن دون السنة الثانية) وطفل ذكر واحد في المجموعة الشاهدة؛ فُوجِد في المصابين بعدوى المسالك، بهم حالة مصابة بإسهال جائر *invasive*، و7 حالات مصابة بالحمى، و5 حالات مصابة بالقيء. لذلك يوصي الباحثان في حالة الأطفال المصابين بإسهال حاد، بالفحص عن عدوى المسالك البولية للرضع من الإناث المصابات بالحمى، واللاتي تتراوح أعمارهن بين 5 و15 شهراً.

ABSTRACT To determine when children with acute diarrhoea should be investigated for urinary tract infection (UTI), we studied 120 patients and 120 healthy age- and sex-matched controls aged 4 weeks to 5 years. In those with positive or suspicious urine cultures, bacteriuria or pyuria, urine culture was repeated. We detected UTI in 8 patients (all < 2 years) and 1 boy in the control group. In those with UTI, invasive diarrhoea was observed in 1, fever in 7 and vomiting in 5 patients. In children with acute diarrhoea, investigation for UTI is only recommended for febrile, female infants aged 5–15 months.

L'infection urinaire chez le nourrisson et l'enfant présentant une diarrhée

RÉSUMÉ Afin de déterminer le moment où l'enfant présentant une diarrhée aiguë devrait être examiné à la recherche d'une infection urinaire, nous avons étudié 120 patients et 120 sujets témoins sains appariés selon l'âge et le sexe, âgés de 4 semaines à 5 ans. Pour ceux qui avaient une uroculture positive ou douteuse, une bactériurie ou une pyurie, une nouvelle uroculture a été effectuée. Nous avons détecté une infection urinaire chez 8 patients (tous âgés de moins de 2 ans) et chez 1 garçon dans le groupe témoin. Dans le groupe de patients ayant une infection urinaire, une diarrhée invasive a été observée chez 1 patient, une fièvre chez 7 patients et des vomissements chez 5 patients. Chez les enfants présentant une diarrhée aiguë, la recherche d'une infection urinaire n'est recommandée que pour les nourrissons de sexe féminin, âgés de 5 à 15 mois, qui sont fébriles.

¹Department of Paediatrics; ²Department of Paediatric Nephrology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Islamic Republic of Iran (Correspondence to M.H. Fallahzadeh: fallahzadeh@dr.com).

Received: 29/03/04; accepted: 02/12/04

Introduction

Diarrhoea is common in infants and children, and urinary tract infection (UTI) is the second most common bacterial infection [1]. Diarrhoea may be the presenting symptom in younger children with UTI [2,3].

There have been a limited number of studies on the correlation between UTI and acute diarrhoea [4,5], and it is still not clear when to investigate for UTI in young children presenting with diarrhoea. Therefore, this study aimed at answering this question.

Methods

In this study 120 infants and children referred to the 2 teaching hospitals at Shiraz University were studied. The study was carried out over a 3-month period, August–October 2002. Patients were selected consecutively. Informed consent was obtained from the parents. There were no refusals to participate.

In addition to diarrhoea, 92 patients had vomiting and 32 had fever. Sample size was determined based on the incidence of UTI in the general population and in previous reports [5,6]. The exclusion criteria were:

- age < 4 weeks or > 5 years;
- duration of diarrhoea > 2 weeks;
- use of antibiotics or antiseptics during the preceding 48 hours;
- bladder extrophy or colostomy.

Nine patients were excluded.

A complete history was taken and a physical examination done for each patient by a paediatrician who had training in nephrology. A stool sample was evaluated. If the number of pus cells and/or red blood cells was > 5/high power field, a stool culture was done. If the number of pus cells was

> 10/high power field or a stool sample cultured using routine methods on selenite EMB agar and SS agar (Merck, Darmstadt, Germany) was positive for a pathogenic organism, it was considered invasive diarrhoea [5].

A urine sample was taken for all the patients. This was midstream in those who were toilet trained and by bag collection in the others. The urine samples were transported immediately at 4 °C to the research laboratory in Nemazee hospital. All positive or suspicious urine cultures were repeated; if at least 2 positive cultures with similar sensitivities were found, the sample was accepted as UTI (associated with abnormal enhanced urinalysis or UTI symptoms).

In addition to routine urine culture, enhanced urinalysis and Gram stain were done for all uncentrifuged samples. If the number of white blood cells was $\geq 10/\text{mm}^3$ in uncentrifuged urine, it was considered pyuria. If ≥ 1 microorganism was found in 10 oil immersion fields, it was labelled as bacteriuria [7]. For the patients with pyuria, mixed growth or 10^3 – 10^5 colonies/mL of urine, 2 separate urine samples were taken for routine culture before starting antibiotic therapy.

UTI was defined as 2 positive urine cultures with $> 10^5$ colony-forming units/mL with similar sensitivity patterns.

In the control group, 120 infants and children from kindergartens, matched for sex and age with the study group, were selected. Those who had diarrhoea or had used antibiotics during the preceding 48 hours were excluded from the control group. Urine samples for routine culture were taken as for the patients. If the urine culture was positive, it was repeated and enhanced urinalysis was also done.

Statistical analysis was done using Fisher's exact test.

Results

In both the patient and control groups, male to female ratio was 1.03:1. Mean age was 17.15 (standard deviation 14.5) months for boys and 17.78 (standard deviation 14.1) months for girls; 91 patients (43 males and 48 females) were ≤ 2 years old and there were 17 males among those who were 3–5 years of age.

In 27 (22.5%) patients, duration of diarrhoea was > 5 days. Only 8 patients (6.7%) were identified as having UTI (Table 1) and in the control group UTI was documented in only 1 boy (20 months old, uncircumcised) (0.8%, $P = 0.02$). He also had pyuria and bacteriuria and the microorganism isolated was *Escherichia coli*.

The characteristics of the 8 patients (6.7%) with UTI in the study group are illustrated in Table 2.

Pyuria was present in 14 patients with diarrhoea but whose urine culture was negative (10 with dehydration, 2 with fever and 2 with undetermined cause). Both urine and stool cultures were positive in only 1 patient, but with different organisms (*Shigella* sp. in stool and *E. coli* in urine).

Table 1 Symptoms and clinical findings in 120 children with acute diarrhoea

Condition	All patients (n = 120)		UTI patients (n = 8)	
	No.	%	No.	%
Diarrhoea > 5 days	27	22.5	2	25.0
Vomiting	92	76.6	5	62.5
Pyuria	22	18.3	8	100.0
Invasive diarrhoea	15	12.5	1	12.5
Bacteriuria	11	9.2	7	87.5
UTI	8	6.7	8	100.0

UTI = urinary tract infection.

Three samples had mixed growth. All were negative when the tests were repeated.

The proportion of girls was high in the patients who had UTI (87.5%; $P < 0.05$), and also the proportion which occurred in infants < 1 year (87.5%; $P < 0.05$). Fever was observed in 15.5% of the patients with non-invasive diarrhoea and 87.5% of those with UTI ($P < 0.05$). The presence of vomiting in the group with or without UTI was not statistically significant.

For pyuria, sensitivity was 100% and specificity 87.5%; for positive Gram stain in uncentrifuged urine, sensitivity was 87.5% and specificity 95.6% in those with UTI.

Discussion

When an infant or child presents with diarrhoea, the physician wonders when to consider UTI. Even if UTI is documented in such a patient, it may have no relation to the diarrhoea (asymptomatic bacteriuria) or the microorganism causing the diarrhoea may also produce UTI [5,8]. In some patients with acute or persistent diarrhoea, the UTI may present with parenteral diarrhoea [4–6,9] as was found in our study. Because none of the patients with UTI in our study had positive stool culture with the same microorganism, we did not consider diarrhoea as the cause of the UTI.

Compared to the control group the incidence of UTI in patients with diarrhoea was higher and this was statistically significant. The incidence of UTI in our study was comparable to that in 2 other reports (7.3% and 8.0%) [4,5].

The presence of pyuria and/or bacteriuria by enhanced urinalysis can be suggestive of UTI [2,5]. Duration of diarrhoea was not

Table 2 Characteristics of diarrhoea patients who had urinary tract infection

Patient no.	Age (months)	Vomiting	Fever	Duration of diarrhoea (days)	Pyuria	Bacteriuria	Organism (urine)
1	5	–	+	2	+	+	<i>Pseudomonas</i> sp.
2 ^a	7	+	+	2	+	+	<i>E. coli</i>
3	8	+	–	8	+	+	<i>E. coli</i>
4	8	+	+	1	+	+	<i>E. coli</i>
5	10	+	+	3	+	+	<i>E. coli</i>
6 ^{a,b}	10	+	+	4	+	+	<i>E. coli</i>
7 ^c	11	–	+	1	+	–	<i>E. coli</i>
8	15	–	+	10	+	+	<i>E. coli</i>

^aInvasive diarrhoea.^bPatient 6 was male; all the others were female.^cUrinary symptoms present (irritability during voiding).

predictive of the presence of UTI in this study.

Therefore, in children presenting with acute diarrhoea, we do not recommend routine investigation for UTI except for female infants with fever in the age range 5–15 months.

Acknowledgement

This work has been supported by the vice-chancellor of research, Professor Alborzi, Clinical Research Centre, Shiraz University of Medical Sciences (Grant No. 80-1213).

References

1. Synder HM. Urologic emergencies. In: Fleisher GR, Ludwig S, eds. Textbook of pediatric emergency medicine, 4th ed. Baltimore, Lippincott, Williams & Wilkins, 2000:1585–93.
2. Shaw KN, Gorelick MH. Urinary tract infection in the pediatric patient. Pediatric clinics of North America, 1999, 46(6):1111–23.
3. Dairiki Shortliffe LM. Urinary tract infections in infants and children. In: Walsh PC et al. Campbell's urology, 8th ed. Philadelphia, WB Saunders, 2002:1846–84.
4. Pryles CV, Luders D. The bacteriology of the urine in infants and children with gastroenteritis. Pediatrics, 1961, 28:877–84.
5. Thakar R et al. Urinary tract infection in infants and young children with diarrhea. Indian pediatrics, 2000, 37(8): 886–9.
6. Sibal A et al. Associated infections in persistent diarrhoea—another perspective. Journal of tropical pediatrics, 1996, 42(2):64–7.
7. Hoberman A et al. Is urine culture necessary to rule out urinary tract infection in young febrile children? Pediatric infectious disease journal, 1995, 15(4):304–9.
8. Allerberger FJ et al. Urinary tract infection caused by nontyphoidal salmonella: report of 30 cases. Urologia internationalis, 1992, 48(4):395–400.

9. Jeena PM, Coovadia HM, Adhikari MA. Bacteriuria in children attending a primary health care clinic; a prospective study of catheter stream urine samples. *Annals of tropical pediatrics*, 1996, 16(4):293–8.

Child-related millennium development goals

Of direct relevance to the work that the Child and Adolescent Health and Development unit of WHO's Regional Office for the Eastern Mediterranean is pursuing in the Eastern Mediterranean Region is millennium development goal 4 "Reduce child mortality", for which the target set is to "reduce by two-thirds, between 1990 and 2015, the under-five mortality rate". For this target, three indicators have been selected to help track progress:

- under-five mortality rate,
- infant mortality rate,
- proportion of 1-year-old children immunized against measles.

Of the total list of 18 targets, those of key importance to our work in the Region are:

- Target 2 "Halve between 1990 and 2015, the proportion of people who suffer from hunger", with indicator 4 on "Prevalence of underweight children under 5 years of age";
- Target 8 "Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases", with indicators 21 on "Prevalence and death rates associated from malaria" and 22 on "Proportion of population in malaria risk areas using effective malaria prevention and treatment measures".