Urinary tract infections and failure to thrive among children aged 2 months - 5 years in Diyala province

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Abstract:

Background: Urinary tract infections (UTI) are common pediatric problems. They are most commonly caused by *Escherichia coli* (*E.coli*). Failure to thrive (FTT) is a term given to malnourished infants & younger children who fail to meat the expected standards of growth. Poor growth can be an important clue to a chronic illness as UTI.

Objectives: to determine the rate of UTI among children 2 months-5 years of age with FTT, risk factors, relevant causative bacterial agents, and their antibiotic susceptibility in Diyala province.

Subjects and methods: This study was carried out in Al-Batool Hospital of Pediatrics and Gynecology in Baquba city during a 9-month period from 1 November 2008 to 1 August 2009. One hundred forty children (2 month - 5 year of age) with FTT and 90 children with normal body weight (served as controls) were evaluated for UTI by culture and sensitivity of urine prior to antibiotic therapy.

Results: This study reveals that of the total number of 140 patients with FTT, 38 (27%) of them had UTI; and of 90 control children without FTT, 7 (7.8%) of them had UTI. The commonest causative bacterial agent recovered from urine cultures was *E.Coli*, followed by *Klebsiella aerugines* . In this study, bacterial isolates were mostly sensitive to trimethoprim-sulphamethaxasole (TMP-SMX), gentamicin, cefotaxime and nalidixic acid. The rate of UTI in children with FTT was more in females (40.6%) compared with males (15%) and more in uncircumcised males (22.9%) compared with circumcised males (3.6%).

Conclusion: UTI is significantly prevalent in children with FTT in Diyala province and female sex and uncircumcised male are among the risk factors for UTI.

Key words: Urinary tract infections, Children, failure to thrive

Introduction:

Urinary tract infections are common in childhood and adolescence[1]. Up to 7% of girls and 2% of boys will have a symptomatic, culture-confirmed UTI by 6 years of age[2]. The prevalence of UTI varies with age. During the first year of life, the male : female ratio is 2.8-5.4 : 1. Beyond 1-2 yr, there is a striking female preponderance, with a male : female ratio of 1 : 10[3]. The prevalence of UTI in febrile infants is higher than that in older children and increases with younger age[1]. *E.coli*, ascending from bowel flora, accounts for 90% of first infections and 75% of recurrent infections[4]. Other bacterial causes include klebsiella, proteus, enterococcus, staphylococcus saprophyticus[3,4]. In males, circumcision is reported to significantly reduce the risk of UTI[1]. In a large prospective, multicenter, cross-sectional study, the highest rate of UTI in febrile infants was seen in uncircumcised male infants (21.3%) compared with females (5%) and circumcised males (2.3%)[5]. Infants 1 months to 2 years old present with feeding problems, FTT, diarrhea, vomiting, or unexplained fever; while at 2 years of age, children begin to show the classic signs of UTI, such as urgency, dysurea, frequency, and abdominal pain[4]. UTI may be suspected based on symptoms or findings on urinalysis, or both, but a urine culture is necessary for confirmation and appropriate therapy[3]. Empiric antibiotic therapy is recommended while awaiting culture results if there is a high suspicion of UTI[1].

Failure to thrive is a term given to malnourished infants and younger children who fail to meat expected standards of growth[4]. It is diagnosed by weight that falls or remains below third percentile for age, that decrease crossing 2 major percentile lines on the growth chart over time, or that less than 80% of the median weight for the height of the child[4]. Most FTT is non-organic, and if a careful history and examination do not suggest a physical cause, the investigations will be usually non-contributory[6]. Poor growth can be an important clue to a chronic illness as UTI[4].

The present study aimed to prove a significant relationship between UTI and FTT in Diyala province.

Subjects and method

This study was carried out in Al-Batool hospital of Pediatrics and Gynecology at Baquba city during a 9-month period from 1 November 2008 to 1 August 2009. One hundred forty children (2 month - 5 year of age) with FTT and 90 children with normal body weight(served as controls) were evaluated for UTI by culture and sensitivity of urine specimens prior to antibiotic therapy using mid-stream urine sampling and sterile urine bag collection (in small number of patients). Urine specimens were streaked primarily on blood and MaConkey agar plates. Further bacterial identifications was based on colonal morphology, biochemical reactions and standard bacteriological criteria. Full history and physical examination were done for all patients regarding age, sex, weight, address, chief complaint, chronic illness, circumcision (in males), and genitor-urinary symptoms (as dysurea, frequency, urgency and fever). If the culture shows >100,000 colonies of a single pathogen, or if there are 10,000 colonies and the child is symptomatic, the child is considered to have a UTI[3]. In those small number of children whose urine collections were done by the sterile urine bag collection, if the urinalysis result is positive, the patient is symptomatic, and there is a single organism cultured with a colony count greater than 100,000, there is a presumed UTI[3]. Children with known chronic illness were excluded from the study. All data were statistically analyzed.

Results

The results revealed that the mean age of patients in this study was 18 ± 1.2 months (ranging 2 months – 58 months) and the mean body weight of was 7.97 ± 2.8 kg (ranging 2 − 16 kg).

The mean age of patients with UTI in this study was 18.2 months (ranging 3 − 58 months) and the mean weight of patients with UTI was 7.7 ± 3.25 kg (ranging 3 − 14 kg).

This study reveals that of the total number of 140 patients with FTT, 38 of them had UTI; and of 90 control children without FTT, 7 of them had UTI. The difference is statistically significant (P< 0.05) as shown in table (1).

Table (1): The rates of UTI in study groups .

Study group	Normal		UTI		Total	
	No.	%	**No.**	%	**No.**	%
Patients	102	73	38	27	140	100%
Control	83	92.2	7	7.8	90	100%
P value < 0.05 [S]						

Accordingly, the Odds ratio(OR) in this case control study was 4.4. This means that children with UTI had a risk of 4.4 times of FTT more than children without UTI. The OR was statistically significant in this study (95% confidence interval (C.I.) was 1.8-10.4), as shown in table (2).

Table (2): Odds ratio and 95% confidence interval .

		FTT		Total	OR=4.4 95% C.I.=1.8-10.4
		Yes	**No**		
UTI	**Yes**	38	7	45	
	No	102	83	185	
		140	90	230	

The rate of UTI was significantly higher (P<0.05) in female patients with FTT (40.6%) as compared to male patients with FTT (15.8%), table (3)

Table (3): The rate of UTI in patients with FTT according to the sex of the child.

UTI / SEX	Positive UTI		Negative UTI		Total		
	No.	%	No.	%	No.	%	**P< 0.05 [S]**
Male	12	15.8	12	15.8	76	100	
Female	26	40.6	26	40.6	64	100	
Total	38	27	38	27	140	100	

Regarding the differences in the rates of UTI in patients with FTT, the results showed no statistically significant difference between those patients reside in rural and those reside in urban areas, (p> 0.05), table (4).

Table (4): The rate of UTI in patients with FTT according to the residency.

UTI / Residency	Positive UTI		Negative UTI		Total		
	No.	%	No.	%	No.	%	**P>0.05[NS]**
Urban	15	26.3	42	73.3	57	100	
Rural	23	27.7	60	72.3	83	100	
Total	38	27	102	73	140	100	

The rate of UTI in patients with FTT who have genito-urinary symptoms (as dysurea, frequency,urgency) was 28.9%, and in those without genito-urinary smptoms was 26.3%. The difference was statistically insignificant finding (p> 0.05), table (5).

Table (5): The rate of UTI in patients with FTT according to the genitor-urinary symptoms.

UTI / GUT symptoms	Positive UTI		Negative UTI		Total		
	No.	%	No.	%	No.	%	**P>0.05[NS]**
Positive	13	28.9	32	71.1	45	100	
Negative	25	26.3	70	73.7	95	100	
Total	38	27	102	73	140	100	

The results also revealed that the rate of UTI in circumcised males with FTT was 3.6% and in uncircumcised male with FTT was 22.9%. The difference was statistically significant finding (p< 0.05), table (6).

Table (6): The rate of UTI in male patients with FTT according to the circumcision.

UTI / Circumcision	Positive UTI		Negative UTI		Total		
	No.	%	No.	%	No.	%	**P<0.05[S]**
Circumcised patients	1	3.6	27	96.4	28	100	
Uncircumcised patients	11	22.9	37	77.1	48	100	
Total	12	15.8	64	84.2	76	100	

The commonest bacteria recovered from urine culture was *E.coli* (26, 68.4%), followed by *Klebsiella aerugines* (7, 18.4%) and *proteus mirabilis* (5, 13.2%) respectively, table (7).

Table (7): The distribution of bacteria in positive urine cultures.

Bacteria	**No.**	**%**
E.coli	26	68.4
Klebsiella aerugines	7	18.4
Proteus mirabilis	5	13.2
Total	38	100

The bacterial isolates were mostly sensitive to TMP-SMX (52.6%), followed by gentamicin (23.7%), cefotaxime and nalidixic acid (21% for each), nitrofurantoin (18.4%), rifampicin (15.8), amoxicillin (13.2%) and other antibiotics respctively as listed in table (8).

Table (8): The antibiotics sensitivity pattern of positive urine cultures.

Antibiotics	**No.**	**%**
TMP-SMX	20	52.6
Gentamicin	9	23.7
Cefotaxime	8	21
Nalidixic acid	8	21
Nitrofurantoin	7	18.4
Rifampicin	6	15.8
Amoxicillin	5	13.2
Chloramphenicol	4	10.5
Doxacyclin	4	10.5
Streptomicin	3	7.9

The main clinical presentations of patients with UTI and FTT in this study were fever (76%), diarrhea (52.6%), vomiting (44.7%), dysurea (31.5%), cough (23.7%), frequency (15.8%) skin rash (7.9%), convulsion (5.3%), urgency (5.3%) low body weight (2.6%) respectively, table (9).

Table (9): The rate of clinical presentations of patients with UTI and FTT.

Clinical presentations	No.	%
Fever	29	76
Diarrhea	20	52.6
Vomiting	17	44.7
Dysurea	12	31.5
Cough	9	23.7
Frequency	6	15.8
Skin rash	3	7.9
Urgency	2	5.3
Convulsion	2	5.3
Low body weight	1	2.6

Discussion

This study aimed to highlight the association between UTI and FTT in Diyala province. Both UTI and FTT are common pediatric problems worldwide[1,3,7]. The significantly high rate of UTI in children with FTT in this study (27%) is comparable with other studies worldwide as that reported in South Africa by Kala *et al* (1992) and by Reed *et al* (1995)[8,9]; and that reported in Turkey by Casken *et al* (2000)[10]. However, other studies show lower rates[11,12]. The high level of UTI in children with FTT in Diyala province can be attributed to several factors such as low immunity, bad hygiene (improper cleaning and napping), and delayed diagnosis due to several factors like delayed seeking medical care and poor medical services.

The study revealed that *E.coli* is the most commonly isolated organism from urine cultures of children with FTT (68%). This result is consistent with findings of other studies[8,10,12]. The bacterial isolates of urine cultures in this study were most frequently sensitive to TMP-SMX (52.6%), followed by gentamicin, cefotaxime, and nalidixic acid respectively. Nevethelesss, other studies reported variable results[9,12]. However, Casken *et al* (2000) in Turkey found that most strains of *E.coli* were resistant to TMP-SMX but non of them were resistant to gentamicin[10]. The sensitivity pattern is largely dependent on the type of bacteria and the proper use of antibiotic in the society.

In our study, the rate of UTI in patients with FTT was more in females compared with males and more common in uncircumcised males compared with circumcised males. Theses results are in agreement with the known medical fact which identifies female sex and uncircumcised male as risk factors[1,3,4,13].

This study found no significant relationship between the rate of UTI in children with FTT and the presence or absence of urinary symptoms as dysurea and frequency. Such findings may partially explain the delayed d1agnosis and treatment of UTI .

The study conclude that UTI is significantly prevalent in children with FTT in Diyala province and we recommend doing urine culture and sensitivity for every child with FTT.

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التهابات المجاري البولية و حالات فشل النمو لدى الاطفال من سن شهرين الى ٥ سنوات في محافظة ديالى

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تمهيد: إن التهابات المجاري البولية هي من المشاكل الصحية الشائعة لدى الاطفال. وتتسبب البكتيريا المعروفة ب "ايشريشيا كولاي" بمعظم هذه الالتهابات. ان حالات "فشل النمو" لدى الاطفال تنطبق على اولئك الذين يفشلون في الوصول الى الاوزان القياسية المتوقعة بالنسبة لاعمارهم وترتبط مثل هذه الحالات مع الامراض المزمنة مثل التهابات المجاري البولية.

الأهداف: تحديد معدل التهابات المجاري البولية و عوامل الخطورة والبكتيريا المسببة والمضادات الحيوية الفعالة لها لدى الأطفال تحت سن ٥ سنوات والذين يعانون من حالات فشل النمو في محافظة ديالى.

الأشخاص وطرق العمل: تم اجراء هذه الدراسة في مستشفى البتول للولادة والاطفال في مدينة بعقوبة وخلال مدة ٩ اشهر للفترة من الاول من تشرين الاول ٢٠٠٨ ولغاية الاول من اب ٢٠٠٩. شملت الدراسة ١٤٠ طفلا يعانون من حالة "فشل النمو" اضافة الى ٩٠ طفلا ذوي وزن جسم طبيعي. تم اجراء فحص زرع الادرار وقياس الحساسية للمضادات الحيوية لكلا المجموعتين وذلك قبل استخدام المضادات الحيوية.

النتائج: لقد اظهرت هذه الدراسة انه من مجموع ١٤٠ طفلا يعانون من حالة فشل النمو هناك ٣٨ طفلا يعانون من التهاب المجاري البولية، ومن مجموع ٩٠ طفل ذوي وزن جسم طبيعي هناك ٧ اطفال فقط يعانون من التهاب المجاري البولية، مما يشكل نسبة مئوية قدرها ٢٧% و٧.٨% لكلا المجموعتين على التوالي. واظهرت نتائج زرع الادرار ان بكتيريا(ايشريشيا كولاي) هي البكتريا الاكثر ظهورا تليها بكتيريا(كليبزيلا ايروجنيز). وكذلك اظهرت نتائج الحساسية للمضادات الحيوية لزرع الادرار بان عقار(مثبريم-سلفاميثاكساسول) هو المضاد الحيوي الاكثر فعالية يليه كل من عقار(جنتامايسين)و(سيفوتاكسيم)و(نالدكسك اسد) على التوالي. ووجدت الدراسة ايضا ان معدل التهاب المجاري البولية لدى الاطفال الذين يعانون من "فشل النمو" هو اكبر لدى الاناث منه لدى الذكور، وهو اكبر لدى الذكور غير المختونين منه لدى الذكور المختونين.

الاستنتاج: ان التهاب التهاب المجاري يوجد بمعدلات مهمة لدى الاطفال الذين يعانون من حالة" فشل النمو" في محافظة ديالى، وان الاناث عامة والذكور غير المختونين هما من عوامل الخطورة لذلك.

الكلمات المفتاحية: التهاب المجاري البولية، الاطفال، "فشل النمو"