Original Article

Childhood Urinary Tract Infection in Abakaliki: Etiological Organisms and Antibiotic Sensitivity Pattern

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Abstract

Background: Urinary tract infection (UTI) is a common childhood infection in the Tropics which causes significant illness and is frequently missed, probably because of its non-specific presentation and similarity with other common illnesses. **Objectives:** To determine the prevalence, common etiological agents, and the susceptibility of these pathogens to the commonly available antimicrobial agents in this center. **Materials and Methods:** This was a retrospective study carried out at the Children's Outpatient Clinic and Children's Emergency Ward of Ebonyi State University Teaching Hospital Abakaliki (EBSUTH). The study was carried out between January 1, 2007 and December 31, 2009. **Results:** One hundred ten subjects of the 3625 children seen in the center during the period of study had UTI giving a case prevalence rate of 3.0%. Majority of the patients (59, 53.6%) were less than 2 years of age with a male:female ratio of 1:1.3. Fever was the commonest presenting symptom and the commonest organisms isolated in urine were *Klebsiella* (27, 24.5%), and *Staphylococcus aureus* (24, 21.8%). The drugs that were most sensitive to these organisms were Gentamicin (50, 45.5%), Ceftriaxone (49, 44.5%), and Ciprofloxacin (36, 32.7%). **Conclusion:** The study revealed a high prevalence of UTI among children. *Klebsiella* was the commonest causative organism isolated in the urine. Gentamicin, Ceftriaxone, and Ciprofloxacin were the antimicrobials with the highest sensitivity to all the isolated microorganisms.

Keywords: Etiological organisms, Antibiotic sensitivity, Children, Urinary tract infection

Introduction

Urinary tract infection (UTI) is one of the commonest bacterial infections seen by Pediatricians in children.[1] However, diagnosis remains a difficult task probably because its presentation is non-specific and similar to other common illnesses. This makes it easy to miss children with UTI.[1,2]

UTI occurs in 3 to 5% of girls and 1% of boys during childhood, with the first attack occurring in girls by 5 years, peaking during infancy and toilet training while it is commoner in boys during the first year of life, especially among those who are uncircumcised.[2] The male:female ratio in UTI varies with age, observed as 2.8-5.4:1.0 in the first year of life and changing to 1:10 after the second year of life.[2]

It is hypothesized that UTI is caused by an ascending infection via the urethra.[2] Colonic bacteria, especially *Enterobacteriaceae,* are the commonest organisms isolated from children with uncomplicated UTI. Infection with *Staphylococcus aureus* was thought to be rare in children without indwelling catheters or other sources of infection. However, recent Nigerian studies had observed it as a common cause of UTI in otherwise well children.[3] In 75 to 90% of female children with UTI, the incriminating organism is usually *Escherichia coli* followed by *Klebsiella* and *Proteus* while in the males older than 1 year, *Proteus* is as common as *E. coli* as a bacterial cause of UTI.[1,2]

The diagnosis of UTI in young children is important as it can be a marker for urinary tract abnormalities and, in the newborn,

may be associated with bacteremia. Early diagnosis is critical to preserve renal function of the growing kidney. Delay in initiation of the antibacterial therapy is associated with an increased risk of renal scarring, hypertension, and progression to end-stage kidney disease.[2]

Antibiotic therapy which is the mainstay of treatment is dependent on a number of factors such as the predominant pathogens in the patient's age group, antibacterial sensitivity patterns in the practice area, the clinical status of the patient, the opportunity for close follow-up, and of course, cost of treatment.[4] Recent reports in Nigeria had highlighted the changing pattern of antibiotic sensitivity to the bacterial isolates with increasing resistance to first line antibiotics.[1,3,5-7] Most of these reports were from the South West and Northern Nigeria. However, there is paucity of literature on the prevalence, common etiological factors, and susceptibility of the causative organisms to commonly available antibiotics among children with UTI in the South Eastern Nigeria, and there is no previous study in Abakaliki. The results of this study will help healthcare practitioners in this area to manage UTI in children.

Materials and Methods

This was a retrospective study conducted at the Children's Emergency Unit and the Children's Outpatient Department of Ebonyi State University Teaching Hospital, Abakaliki, Ebonyi State. Abakaliki is the capital of Ebonyi State, located in the South Eastern part of Nigeria.

The data of all children with culture-proven UTI seen between January 1, 2007 and December 31, 2009 were retrieved from the Records Department of the Hospital. Biomedical data including age, sex, and social class, presenting symptoms, results of urine microscopy, culture and sensitivity were retrieved from the subject folders and wherethis were not available, results were retrieved from the records of the laboratory department and were also documented.

The study was approved by the Ethics Committee of the Ebonyi State University Teaching Hospital, Abakaliki and the data were analyzed using simple statistical methods.

Results

One hundred andten of the 3 625 children seen in the center during the period of study had proven UTI, giving a case prevalence rate of 3.0%. Table 1 shows the age and sex distribution of the children. There is a slight female preponderance with a male:female ratio of 1:1.3. UTI was more common in children younger than 24 months, present in 59 (53.6%) children.

Table 2 highlights the common presenting symptoms among these children. Fever was the presenting symptom in 84 (76.4%) children and was most common, other common symptoms included vomiting (19, 17.3%), diarrhea (18, 16.4%), and abdominal pains (13, 11.8%). Most patients presented with more than one symptom.

Fifty-four (49.1%) children received antibiotics prior to presenting to hospital and in two (1.8%), this information was not documented. The remaining children (54, 49.1%) did not receive antibiotics prior to presentation. Table 3 shows the organisms cultured from the urine of the study patients. The commonest organism cultured in this study was *Klebsiella* (27, 24.5%) followed by *S. aureus* (24, 21.8%) while in seven (6.4%) children, the urine samples yielded mixed growth on culture. *Klebsiella pneumoniae* is more common among children less than 2 years old (15/27, 66.7%), while *E. coli* was predominantly cultured in the urine of female children comprising (12/15, 80%) infections.

The sensitivity to some of the antimicrobials on the cultured bacterial organisms is shown in Table 4. Gentamicin (50, 45.5%), Ceftriaxone (49, 44.5%), and Ciprofloxacin (36, 32.7%) were the drugs with highest sensitivity to the organisms cultured.

Discussion

The prevalence rate of 3.0% of UTI obtained in this study is lower than values obtained from other centers in this

Table 1: Shows the age and sex distribution of children with UTI

Age (months)	Sex		Total	Percent
	Male (%)	Female (%)		
0-24	22 (12.7)	37 (20.0)	59	53.6
25-59	6 (2.7)	9 (3.6)	15	13.7
≥60	20 (18.2)	16 (14.5)	36	32.7
Total	48 (43.6)	62 (56.4)	110	100.00

UTI: Urinary tract infection

Table 2: The common presenting symptoms in the patients

Symptoms	Frequency	Percent
Fever	84	76.4
Vomiting	19	17.3
Diarrhea	18	16.4
Abdominal pains	13	11.8
Body/leg swelling	11	10.0
Hematuria	9	8.1
Dysuria	6	5.5
Frequent urination	4	3.6
Weight loss	3	2.7
Flank pains	3	2.7
Convulsion	3	2.7
Headache	2	1.8
Other	53	48.3
Total	110	100

N.B: Total no. of patients is 110; however, most of the patients presented with multiple symptoms

Table 3: The distribution of organisms cultured from the urine among the different sexes and age groups

Sex	Male			Female			Total
Age (Months)	0-24	25-59	≥60	0-24	25-59	≥60	
Organism cultured							
Klebsiella	5	2	5	13	0	2	27
Staph Aureus	6	2	4	4	3	5	24
Pseudomonas	1	2	4	6	3	0	16
Strep. species	5	0	4	3	1	3	16
E. coli	2	0	1	8	2	2	15
Proteus	0	0	1	2	0	1	4
Citrobacter	0	0	0	0	0	1	1
Mixed growth	3	0	1	1	0	2	7
Total	22	6	20	37	9	16	110

Staph: *Staphylococcus*, Strep: *Streptococcus*

Table 4: Antibiotic sensitivity of bacterial isolate in childhood urinary tract infection

Organism	N	Gent (%)	Ceftra (%)	Cipro (%)	Ofla (%)	Caz (%)	Perflo (%)	CXM (%)	CTX (%)
Klebsiella	27	11 (40.7)	11 (40.7)	13 (48.1)	7 (25.9)	4 (14.8)	7 (25.9)	3 (11.1)	4 (14.8)
Staph. aureus	24	13 (54.2)	12 (50.0)	8 (33.3)	5 (20.8)	6 (25.0)	5 (20.8)	3 (12.5)	3 (12.5)
Pseudomonas	16	9 (56.3)	10 (62.5)	3 (18.8)	4 (25.0)	5 (31.3)	2 (12.5)	0 (0.0)	2 (12.5)
Strep. Species	16	9 (56.3)	7 (43.8)	4 (25.0)	6 (37.5)	2 (12.5)	2 (12.5)	3 (18.8)	2 (12.5)
E. coli	15	5 (33.3)	5 (33.3)	6 (40.0)	5 (33.3)	8 (53.3)	2 (13.3)	3 (20.0)	1 (6.7)
Proteus	4	2 (50.0)	3 (75.0)	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Citrobacter	1	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)
Mixed growth	7								
Total	110	50 (45.5)	49 (44.5)	36 (32.7)	27 (24.5)	25 (22.7)	18 (16.3)	13 (11.8)	12 (10.9)

Gent: Gentamicin, Cefur: Cefuroxime, Perfla: Peflacine, Ceftr: Ceftriaxone, Eryth: Erythromycin, Ofla: Oflaxocine, Cipro: Ciprofloxacin, Cefta: Ceftazidine

country.[1,3-6] This being a retrospective study, some cases may have been missed either due to under diagnosis or incomplete records. The other possible reason for the difference may be because of the difference in patients' selection, while this study presents the prevalence of UTI among children presenting in the hospital; Adedoyin *et al*.[1] reported a prevalence rate of 21.4% of UTI among children who were on admission for other illnesses. In Benin, the prevalence of 9% was reported among febrile under-five children, while a higher UTI prevalence rate of 24.1% was obtained among children with acute nephritic syndrome.[3,4] Rabassa and Shattima[5] working in Maiduguri reported a prevalence of 11.3% in children with severe protein energy malnutrition who were screened for UTI. The prevalence rate obtained from the present study is comparable with the finding by Hoberman and Wald[6] in Pittsburg where they noted a prevalence rate of 5.3% among febrile infants seen in their Emergency Department.

The previously reported predominance of UTI among children younger than 5 years was demonstrated in this study, where 67% of them were under-5 children and 53.6% were in fact less than 2 years old.[1-3] Although UTI was more common among females in this report, the male to female ratio of 1:10 found in earlier studies in Caucasian children was not confirmed by the findings in this study.[2,6] This finding is however similar to previous Nigerian reports.[1,3-5] The reason for this is not clear; however, in view of the reported association between malaria,[7]

sickle cell anemia,[8] malnutrition,[9] and pediatric human immune deficiency virus (HIV) infection which are common in this environment and UTI, one wonders if this could partly explain the reported increased prevalence among males.

Similar to other studies, fever was the predominant presenting symptom reported in 76% of patients. The high prevalence of non-specific symptoms like vomiting and diarrhea and the relative rarity of disease-defining symptoms like loin pain, frequency of micturition and dysuria in this study apparently support the need for screening all febrile children for UTI.[1,2,6]

Klebsiella spp (24.5%), *S. aureus* (21.8%), *Pseudomonas aeruginosa* (14.5%), *Streptococcal* spp (14.5%), and *E. coli* (13.6%) were the organisms frequently isolated in urine samples of these children. These were also the organisms most commonly isolated in other centers in Nigeria[1-5] and are mainly gut organisms that can easily contaminate the urinary tract. However, in this report, *E. coli* had a less prominent role unlike in previous reports where it tended to be the most common causative isolate in urine cultures. In this study, *E. coli* occurred most commonly among females (80%), the reason for this is not clear as it is the contribution of the high rate (50%) of pre-hospital presentation antibiotic administration to the organism profile.

The antimicrobials that showed the greatest sensitivity to the isolated organisms were Gentamicin (45.5%), Ceftriaxone

(44.5%), and Ciprofloxacin (32.7%). The increased sensitivity of urinary tract isolates to gentamicin, the quinolones, and cephalosporins has been previously documented in other centers in Nigeria.[3,4] The reduced sensitivity of first line drugs such as Amoxicillin, cotrimoxazole, Nalidixic acid, and Nitrofurantoin are also similar to previously documented reports.[10,11] The role of pre-presentation antibiotic use as documented in this study to the development of resistance to these commonly available drugs is difficult to evaluate. The sensitivity of these so-called more sensitive drugs were also suboptimal as their sensitivity levels were less than 50% and cannot be dependent on for empiric treatment of UTI in Abakaliki.

Conclusion

UTI is a common childhood illness seen in EBSUTH Abakaliki, fever being most common presenting symptom and *Klebsiella* and *S. aureus* being the most common organism cultured in the urine of these children. Although gentamicin, ceftriaxone, and ciprofloxacin were the antibiotics with the highest sensitivity to the isolated organisms, their sensitivity is still low. Though they can be used for empiric therapy in UTI, the urine of all suspected cases of UTI should be cultured and sensitivity pattern determined for appropriate treatment.

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