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Efficacy of zinc as adjunct in the treatment of pneumonia in children less than five years: a meta-analysis

*Kathlyne Anne Caling Abat, MD, Jacinto Blas V. Mantaring III, MD
University of the Philippines College of Medicine-
Philippine General Hospital.....2*

Clinical and laboratory profile of urinary tract infection among children at the outpatient clinic of a tertiary hospital

*April Gamier Bay, MD, Francisco Anacleto, Jr., MD
University of the Philippines College of Medicine- Philippine
General Hospital.....10*

Terror in the air: meningococcal disease outbreak in the philippines

*Xenia Cathrine T. Jaramillo Fabay Baguio General Hospital
and Medical Center 3rd Prize, PIDSP Poster Contest 2007.....17*

Profile of pediatric patients with dengue fever/dengue hemorrhagic fever over a five-year period (2000-2004)

Jonathan G. Lim, MD, Salvacion R. Gatchalian, MD,*/** Ma. Rosario
Z. Capeding, MD** * University of the Philippines College of Medicine-
Philippine General Hospital **Research Institute of Tropical Medicine,
Muntinlupa26*

The antihelminthic efficacy of pineapple fruit mebendazole on soil transmitted helminthiases: a randomized controlled trial

*Charina A. Manabo, MD, Melchor Victor G. Frias, MD
De La Salle University Medical Center.....35*

Risk factors for candidemia in the neonatal intensive care unit of the philippine general hospital from october 2003 to august 2006: a case-control study

Novette Regina M. Morales-Lagunza, MD, Jacinto Blas
V. Mantaring, MD* University of the Philippines College of
Medicine- Philippine General Hospital44*

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CLINICAL AND LABORATORY PROFILE OF URINARY TRACT INFECTION AMONG CHILDREN AT THE OUTPATIENT CLINIC OF A TERTIARY HOSPITAL

AUTHORS: April Gamier Bay, MD, Francisco Anacleto, Jr., MD
University of the Philippines College of Medicine- Philippine General Hospital

KEYWORDS

urinary tract infection, children, incidence, clinical profile, diagnosis

ABSTRACT

Introduction: Urinary tract infection (UTI) is a common reason for outpatient consults. It is almost always in the Top Ten consults at the sick-child clinic of a tertiary hospital. However, a study concerning the incidence and clinical and laboratory profiles of UTI in the Philippines has yet to be documented.

Objectives: To determine the incidence rate and clinical and laboratory profiles of UTI among patients who consulted at the pediatric outpatient clinic of a tertiary hospital.

Methods: All patients 0 to 12 years, who were UTI suspects and consulted at the Sick-Child Clinic of a tertiary hospital from January to December 2006 were included in the study. Patients who had recurrent UTI or history of previous UTI and those with co-morbidities such as anatomic and/or functional problems involving the urinary tract were excluded. Chart review was done and the following were noted: demographics and clinical and laboratory characteristics.

Results: Four hundred twenty three patients were included in the study. The incidence rate was 30 per 1000 persons (95% CI). 54% percent were female. The majority of the patients were between 7 to 12 years of age. The most common presenting symptoms were fever, abdominal pain, vomiting, and dysuria. Only 25 patients had urine culture done and only 8 had positive results, mostly with *E. coli*. The most common antibiotics used were Cotrimoxazole, Cefuroxime, and Amoxicillin.

Conclusion: The incidence rate is higher compared to other studies done in general practice. The presenting signs and symptoms were however similar. Important to note is the high incidence of patients who did not follow up. It is also noted that the gold standard for the diagnosis of UTI, which is the urine culture is very seldom requested. This may lead to the over- or maybe under-diagnosis of UTI and its eventual mismanagement. Therefore, it is recommended that the approach to the diagnosis and management of UTI in children should be reviewed.

INTRODUCTION

A urinary tract infection (UTI) is a bacterial infection that affects any part of the urinary tract. It is one of the most common bacterial infections among children. However, the epidemiology of UTI is confounded by the variability and non-specificity of signs and symptoms of infection in infants and young children.¹ The incidence of UTI and its clinical impact are very different for both sexes and at different stages of life.² It is known that UTI is more frequent in boys in the first 3 months of life, with sex distribution of 5:1 (male predominance). By preschool age, the sex ratio

is reversed, with majority of UTI occurring in females.³

Although UTI is infrequently associated with mortality, it is still a significant cause for morbidity. Delay in the treatment of UTI can lead to vesicoureteral reflux and renal scarring. Renal scarring has been cited as one of the most common causes of end stage renal disease in both adults and children.⁴

UTI is a common cause for a significant number of out patient visits.³ In the pediatric outpatient clinic of a tertiary hospital in the Philippines, it remains in the Top Ten Consults almost every year. Keeping in view the high incidence of UTI in children and its associated

morbidity, it is imperative to diagnose UTI early and to treat the infection promptly. This study proposed to look into the clinical profile of UTI in children presenting at the pediatric outpatient clinic of a Tertiary Hospital.

REVIEW OF RELATED LITERATURE

Urinary tract infection is defined as the presence of bacteria in urine along with symptoms of infection. The first and most critical step in establishing the diagnosis of UTI is the method by which urine is collected. In young patients, care must be taken in preparing the perineum and periurethral area for placement of the sterile plastic receptacle, which will be used for collection of urine. In infants, the best way to obtain urine for culture aseptically is by urethral percutaneous suprapubic bladder aspiration or by catheterization. These procedures avoid the potential problem of contaminated urine cultures that often result from bag specimens. Older children and adolescents can be instructed to collect a midstream urine specimen after proper cleansing of the urethral area. Demonstration of bacteria microscopically is the most reliable and fastest mean to establish the diagnosis of UTI before results of urine cultures are available. The presence of 10^5 colony forming units (CFU) of a single organism per mil of urine is diagnostic of UTI.⁵

Studies conducted at Parkland Memorial Hospital in Dallas demonstrated that the incidence rate of UTI in infants (6 months of age and younger) was 1.65 cases/1000 live births from (in) 1972 to 1975, and 2.04 cases/1000 live births from (in) 1977 to 1980. The male: female ratios were 2.7:1 and 5:1, in the two time periods.⁶

Boys are more susceptible to UTI before the age of 3 months; thereafter, the incidence is substantially higher in girls. Estimates of the true incidence of UTI (urinary tract infection) depend on rates of diagnosis and investigation. At least 8% of girls and 2% of boys will have UTI (a urinary tract infection) in childhood.

In 2005, a study was done at Ayub Teaching Hospital in Pakistan to look into the clinical profile of UTI in children admitted at the pediatric wards. Said study showed that the majority of UTI patients (46%) belonged to the age group 13 to 60 months: The number of UTI cases was less among neonates; the number of cases increased in the older age group, but it declined in the thirteen to fifteen age group. Fever was the most common presentation; 92% of the patients had history of fever. Dysuria is a common presentation in older children (4% to 60.8%).³

Also in 2005, the profile of children with UTI who consulted at a Chilean pediatric emergency institution/clinic showed that UTI was 1.78 times more frequent in girls. The most common clinical presentations were fever and urinary tract symptoms. For patients who are more than 2 years old, urinary tract symptoms and previous UTI, were risk factors for UTI. The most frequent organism isolated was *Escherichia coli* (86%).⁸ Based on the previous studies, reported incidence rates of childhood UTI vary. For boys the reported incidence rates range from 0.17 to 18 per 1000 person years and for girls from 0.4 to 66 per 1000 person years. This variation may be explained by differences in setting, health care system, age range, case definition, or study period. The range of occurrence rates is found to be much smaller in studies carried out in general practice. From 2000 to 2002, a national survey was conducted in Sweden involving general practice and involving patients 0 to 18 years old; it was published in 2006. The results showed an overall incidence rate of 19.0 episodes of UTI presented in general practice per 1000 person years for children under the age of 18 years (95% CI: 18.1 to 19.9). In other words, if 1000 children, who are 0 to 18 years old, are monitored/checked on for one year, their general practitioner would have made 19 times more diagnoses of UTI. The incidence rate in girls was almost 8 times higher than in boys (respectively, 34.4 episodes per 1000

person years vs. 4.4 episodes per 1000 person years, $p < 0.001$).⁹

In the local setting, a study was done in 1997 at the Pediatric Emergency room of the Philippine General Hospital among subjects less than 2 years old. This study was conducted to determine the prevalence of UTI among febrile infants and young children with or without apparent source of fever. A total of 40 patients were included in the study. Results showed that the prevalence of UTI was 7.5% (95%CI: 15.7%-20.7%): all were males and with apparent sources of fever. However, due to the limited number of subjects, the results were inconclusive.⁴

OBJECTIVES

The aim of the study was to determine the clinical and laboratory profile of UTI in children presented at the pediatric outpatient clinic of a tertiary hospital.

MATERIALS AND METHODS

This study is retrospective and descriptive.

Subjects (included) were patients, who were 0 to 12 years old, were suspected of having UTI and consulting at the Sick-Child Clinic of a tertiary hospital from January to December 2006. Excluded from the study were patients who had previous histories of UTI or with recurrent UTI and those with co-morbidities such as anatomic and/or functional problems involving the urinary tract (i.e. those that would cause neurogenic bladder, vesicoureteral reflux, etc). Charts of all eligible subjects were reviewed and the following information were collected: age, sex, signs and symptoms, urinalysis results, urine culture results, antibiotics used, other workups done, and the patient's disposition upon follow up.

Definition of Terms

UTI suspect – with signs and symptoms that are associated with UTI

Presumptive UTI – positive for pyuria on urinalysis

Confirmed UTI – positive for pyuria documented by positive urine culture

Recurrent UTI – occurrence of the disease at least twice a year

Pyuria – urinalysis with ≥ 5 WBC/hpf

Positive urine culture – with $\geq 100,000$ CFU/ml of urine of a single pathogen

RESULTS

A total of 457 charts were reviewed for the study period of January to December 2006. Thirty four patients were excluded: 11 patients had recurrent UTI, 7 had Acute Glomerulonephritis, 3 had Nephrotic Syndrome, 1 had Lupus nephritis, 1 had diabetic nephropathy, 5 had phimosis, 1 had hypospadias, 1 had epispadias, and 3 had neurogenic bladder. Four hundred twenty three UTI suspects were included in the study.

Of the 423 patients included in the study, 228 (53.9%) were females and 195 (46.1%) were males (Table 1). Table 1 also shows that the majority of patients belong to the 7-to-12-years-old group or the school-age group, showing a total of 180 patients or 42.6% of the population. This is closely followed by the 3-to-6-years-old age group, with a total of 166 patients or 39.2%.

Fever was the most common presenting symptom, accounting for 63.6% of patients. It was the most common symptom for all age groups. This was followed by abdominal pain (57%), vomiting (35.9), and dysuria (30.7%). For the age group of 0 to 3 mos, diarrhea, irritability, and staining were the other symptoms noted. For the 4 to 12mos age group, vomiting and irritability were second only to fever. For the rest of the age groups, other symptoms noted were anorexia, diarrhea and frequency.

Among the subjects of the study, 44.4% did not come back for a follow-up, hence no urinalysis was recorded. Only 35.2% of the UTI suspects had pyuria, therefore had presumptive UTI. In terms of urine culture, 94.1% of the subjects had no urine culture done. Only 1.9% of the subjects had bacteriuria.

Among those who had urine culture done, 7 showed no growth after 2 days of incubation;

Table 1. Distribution of UTI suspects according to age and sex.

Age	Male	Female	TOTAL
	No. (%)	No. (%)	No. (%)
0-3mos	4 (1.0)	2 (0.5)	6 (1.4)
4mos- 12mos	15 (3.5)	8 (1.9)	23 (5.4)
13mos – 2yrs	21 (5.0)	27 (6.4)	48 (11.4)
3yrs – 6yrs	83 (19.6)	83 (19.6)	166 (39.2)
7yrs – 12yrs	72 (17.0)	108 (25.5)	180 (42.6)
TOTAL	195 (46.1)	228 (53.9)	423 (100)

Table 2. Clinical Manifestations according to age group.

Signs and symptoms	0-3m	4 – 12mos	13mos – 2years	3years – 6years	7years– 12years	TOTAL	%
Abdominal pain			11	111	119	241	57.0
Abdominal tenderness			2	11	17	30	7.1
Anorexia			4	43	29	76	18.0
Constipation			2	3	2	7	1.7
CVA tenderness				2	3	5	1.2
Diarrhea	1	2	6	11	23	43	10.2
Dribbling			2	1	5	8	1.9
Dysuria			8	61	61	130	30.7
Fever	6	18	36	107	102	269	63.6
Flank pain				1	25	26	6.1
Frequency			4	25	22	51	12.1
Genital discharge				11	1	12	2.8
Genital pain				6	1	7	1.7
Hematuria			2	7	16	27	6.4
Intermittency				4	3	7	1.7
Irritability	1	2				3	0.7
Nausea			1	6	15	22	5.2
Oliguria		1	1	8	3	13	3.1
Staining	1	1				2	0.5
Straining on urination		1	4	9	2	16	3.8
Urgency				4	5	9	2.1
Vomiting		9	15	62	66	152	35.9

* Patient may present with one or more signs and symptoms

* Legend: Years – y; Months – m

10 showed growth of pathogens, but were <100,000CFU/ml of urine. Among those who showed positive for bacteriuria, *Escherichia coli* (44.4%) was the most common organism found, followed by *Enterobacter* spp. (16.7%), and *Pseudomonas aeruginosa* (11.1%).

The most common antibiotic used among our subjects was Cotrimoxazole (26%); this is followed by Cefuroxime (13.2%) and Amoxicillin (9.2%). Some of our subjects were untreated (44.7%).

Table 3. Results of Urinalysis and Urine Culture

Urine WBC	No. (%)
WBC < 5/hpf	86 (20.3)
WBC ≥ 5/hpf	149 (35.2)
Urinalysis not done	188 (44.4)
Urine Culture	
Positive	8 (1.9)
Negative	17 (4.0)
Not done	398 (94.1)

Table 5. Organisms obtained from the urine culture.

Organisms	<100,000 CFU/ml	≥100,000 CFU/ml	TOTAL
	No. (%)	No. (%)	No. (%)
<i>Klebsiella pneumoniae</i>	-	1 (5.6)	1 (5.6)
<i>Escherichia coli</i>	3 (16.7)	5 (27.8)	8 (44.4)
<i>Acinetobacter baumannii</i>	1 (5.6)	-	1 (5.6)
<i>Staph. aureus</i>	1 (5.6)	-	1(5.6)
<i>Staph. spp.</i>	1 (5.6)	-	1 (5.6)
<i>Enterobacter</i>	2 (11.1)	1(5.6)	3(16.7)
<i>Pseudo aeruginosa</i>	1 (5.6)	1 (5.6)	2 (11.1)
<i>Strep pyogenes</i>	1 (5.6)	--	1(5.6)
TOTAL	10 (55.5)	8 (44.4)	18 100

Other laboratory workups requested for our subjects were KUB-UTZ (10.6%), KUB-IVP (1.7%), and VCUg (0.9%). On follow up, 7.1% of our subjects were found to have improved, 1.7% had recurrent UTI, and another 1.7% had

persistent UTI. However, 88.2% of our subjects were eventually lost to follow up.

Table 6. Antibiotics used.

Antibiotics	No. (%)
Amoxicillin	39 (9.2)
Cefaclor	1 (0.2)
Cefalexin	9 (2.1)
Cefixime	1 (0.2)
Cefuroxime	56 (13.2)
Chloramphenicol	3 (0.7)
Ciprofloxacin	1 (0.2)
Co-Amoxiclav	9 (2.1)
Cotrimoxazole	110 (26.0)
Nitrofurantoin	3 (0.7)
Ofloxacin	1 (0.2)
Penicillin	1 (0.2)
No treatment	189 (44.7)

Table 7. Other laboratory examinations done.

Other laboratory exams	No. (%)
KUB IVP	7 (1.7)
KUB UTZ	49 (11.5)
VCUG	4 (0.9)

Table 8. Disposition on follow up.

Disposition	No.	(%)
Cystolithiasis	1 (0.2)	
Hydronephrosis	1 (0.2)	
Nephrolithiasis	1 (0.2)	
Persistent UTI	7 (1.7)	
Recurrent UTI	7 (1.7)	
Renal agenesis	1 (0.2)	
Renal parenchymal disease	1 (0.2)	
VUR	1 (0.2)	
Improved	30 (7.1)	
Lost to follow up	373 (88.2)	
TOTAL	423 (100)	

DISCUSSION

In this study, 423 UTI suspects were identified with a computed incidence rate of 30 per 1000 persons (95% CI). This value is much higher than in the study done in Sweden, where the incidence rate was only 19 per 1000

persons.⁹ The value we got for the present study may be an over estimation since a large percentage of these UTI suspects (44.4%) were actually lost to follow up and diagnosis was not supported by a urinalysis. If we look at the incidence rate of patients with presumptive UTI, which is 10.5 per 1000, this is closer to the reported incidence rate from previous studies.

The present study showed that the majority of patients belonged to the age group 7 to 12 years. However, if we combined the age groups 13 mos to 2 years and 3 to 6 years, they accounted for 214 patients or 50.6% of the population. These combined values will approximate the findings of the study in Pakistan where it was showed that 46% of their subjects belonged to the age group 13 to 60 months.³ This could be because, as reported by other studies, those who belong in the age group of 13 to 60 months are having toilet training problems, and thus, more susceptible to infections.

It is known that UTI is more frequent in boys in the first 3 months of life. In the present study, this was also true; male to female ratio of 2:1. The sex ratio is equal, instead of reversed by the preschool age (1:1). The reversal of the sex ratio was more apparent in the pre-adolescent age (1:1.5) with majority of UTIs occurring in females. Overall, in terms of gender distribution, our study showed that UTI was 1.5 times more frequent in girls. This is very close to the value arrived at in the study done at a Chilean Hospital which showed that UTI was 1.78 times more frequent in girls.⁸

Similar to previous studies, fever was the most common presentation for all age groups. It accounted for 63.6% of the study population which is comparable to the proportion reported by the study done in Pakistan which was 92%.

In the Philippines, the diagnosis of UTI is based on the clinical presentation of the patient; it is often times supported by urinalysis, but rarely confirmed by urine culture and sensitivity. That is why most UTIs were presumptive, because bacterial growth was never documented; to do so is very costly.⁴

These statements were verified in this study. Among the 423 UTI suspects, only 235 had urinalysis done and a mere 149 had pyuria. Disappointingly, only 25 had urine culture done and only 8 were confirmed to have bacteraemia.

Among those that showed positive for urine culture, *Escherichia coli* was the most frequent organism isolated. This is in complete agreement to the findings in a study done in Chile.

The most common antibiotics used for the subjects in this study were Cotrimoxazole, Cefuroxime, and Amoxicillin. According to the 2004 Clinical Practice Guideline as regards the approach and treatment of UTI in children in the Philippine setting, Amoxicillin and Cotrimoxazole are in the list of antibiotics for oral treatment of UTI. Cefuroxime is not in the said list.

CONCLUSIONS/RECOMMENDATIONS

The incidence rate of UTI in a tertiary Hospital Outpatient Clinic is higher compared to other studies done in general practice. This may be attributed to over estimation due to a high incidence of patients being lost to follow up. UTI is more common among patient the age group of 13 months-6years. UTI is generally more common in females than in males. In early infancy though, males are more susceptible but as the age increases the gender ratio is reversed. The presenting signs and symptoms were however similar, fever being the most common presentation in all age groups. This study confirmed that in the local setting, the diagnosis of UTI is based on clinical presentation of the patient, often times supported by urinalysis, rarely confirmed by urine culture and sensitivity. Most UTIs were presumptive since bacterial growth was never documented.

RECOMMENDATIONS

It is recommended that dipstick test should be made available at the outpatient clinic in order to lessen the incidence of patients being lost to follow up and, at the same time, to ensure the appropriate management of the

patients. Another recommendation is that the approach to the diagnosis and management of UTI in children should be reviewed and these guidelines should be followed as much as possible. Urine culture should be done more often, if not all the time, in order for us to be sure that we are using the correct antibiotic. Also we recommend that ultrasound and cystogram be requested as proposed by acceptable guidelines.

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