CAUSATIVE ORGANISMS AND THEIR SENSITIVITY PATTERN OF URINARY TRACT INFECTION IN CHILDREN OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Urinary tract infection (UTI) can be defined y the presence of significant quantity of bacteria in the urine along with signs and symptoms of infection. UTI is an important cause of bacteremia due to gram negative organisms. Prompt diagnosis and management of UTI can reduce the incidence of morbidity and life threatening bacteremia.

Approximately 3 – 5% of the girls and 1% of the boys acquire a UTI. UTI can lead to renal scars and if undiagnosed leads to permanent renal damage causing hypertension or end stage renal disease. The diagnosis of UTI is difficult in the neonatal period because the signs and symptoms are non-specific in this age group. Every child with a proven UTI deserves investigation after first attack. Diagnostic workup could be modified to recognize any condition that leads to stasis of the urine in the bladder.

Objective: The objective of my study was to determine the drug sensitivity pattern of the causative organisms causing urinary tract infection in children of a tertiary care hospital.

Study design: It was a cross sectional study.

Duration of study: The study was conducted in a period of about 6 months (from January 2014 to June 2014).

Setting: The study was carried out in the Department of Pediatrics, Post Graduate Medical Institute, Hayatabad Medical Complex, Peshawar a tertiary health care facility.

Materials and Methods: 100 children both admitted and attending the outpatient department in Pediatrics Unit, with confirmed UTI, were selected according to the inclusion/ exclusion criteria by convenience method. All the patients' parents were interviewed with the help of a proforma. The data were analyzed by applying the descriptive statistics.

Result: Out of 100 children enrolled, 56 were boys and 44 girls. 30% children were amongst age group 3 to 12 months, 52% among 1—5 years and 18% among above 5 years old. The most common urinary pathogen isolated was E. Coli (63%) sensitive most often (84% sensitivity) to Amikacin. Overall sensitivity of different urinary isolates to amikacin was highest (82%). 37 boys (66%) with urinary tract infection were circumcised.

Conclusion: Owing to its high prevalence, early detection and treatment of the urinary tract infection in infants and children may be the only way to reduce the incidence of reflux nephropathy and to prevent renal damage.

Keywords: Drug sensitivity, DMSA, Suprapublic aspiration, Urine culture, Vesicoureteral Reflux (VUR), Voiding cysto-urethrogram (VCUG)

INTRODUCTION

The urinary tract is a relatively common site of infection in infants and young children. Urinary tract infection (UTI) is a problem that is frequently encountered by pediatric healthcare providers. UTIs are the second most common infection after respiratory tract infections in children. Over recent decades, the importance of UTI has been increasingly recognized, in particular the role of UTI as an occult cause of febrile illness in young children.

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UTIs are important because they cause acute morbidity and may result in long-term medical problems, including hypertension and reduced renal function. Management of children with UTI involves repeated patient visits, use of antimicrobials, exposure to radiation, and cost. Accurate diagnosis is extremely important for two reasons: to permit identification, treatment, and evaluation of the children who are at risk for kidney damage and to avoid unnecessary treatment of children who are not at risk, for whom interventions are costly and potentially harmful but provide no benefit. Infants and young children with UTI are of particular concern because the risk of renal damage is greatest in the age group and because the diagnosis is frequently challenging: the clinical presentation tends to be non-specific and valid urine specimens cannot be obtained without invasive methods (suprapubic aspiration {SPA}, transurethral catheterization).

Considerable variation in the method of diagnosis, treatment, and evaluation of children with UTI was documented more than 2 decades ago. Since then, various changes have been proposed to aid in diagnosis, treatment, and evaluation, but no data are available to suggest that such innovations have resulted in reduced variation in practice.

Data Collection Procedure

All the children of either sex, between three months and twelve years of age, attending the out patient department (OPD), emergency department and those referred from private clinics having history suggestive of UTI, were admitted.

Each child was enlisted for the study only after an informed consent from the parents/caretakers. After taking the history and identifying any risk factor, the relevant clinical examination was carried out. After making sure that no antibiotics have been used in the previous 48 hours, a proper urine sample was obtained, which in case of infant was the application of an adhesive, sealed, sterile collection bag, after disinfection of the skin of genitals, and in toilet trained children, a mid stream sample. The sample properly labeled, was sent to the hospital laboratory for urinalysis and culture from the same specimen. Each patient after his/her urine being sent for culture sensitivity was started empirically on either amikacin or ceftriazone in random fashion which was changed according to the expected drug sensitivity pattern were needed. Other investigations included full blood count, renal ultrasound, serum electrolytes, blood urea nitrogen and serum creatinine were also carried out.

Data Analysis Procedure

The data was presented as means or proportions and percentage. These ware compared with each others. My study variables were age, gender, fever, lethargy, vomiting, poor feeding dysuria, irritability , abdominal/ suprapubic pain, incontinence, frequency, urgency, constipation, diarrhea, foul smelling urine, pinworm infestation, enuresis and crying during micturition. Descriptive statistics were used to compute these variables; mean and standard deviation for quantitative variables like age and frequency % for qualitative variables like gender, fever, lethargy, vomiting, weight loss etc. the data was analyzed on computer using SPSS version 14.

RESULTS

In the six months study period, a total of 100 children, all in patients, with positive urine culture, were enrolled. The results based on these children and their culture and sensitivity reports are detailed below:

The group of children included in the study comprised fifty six (56%) boys and forty four (44%) girls

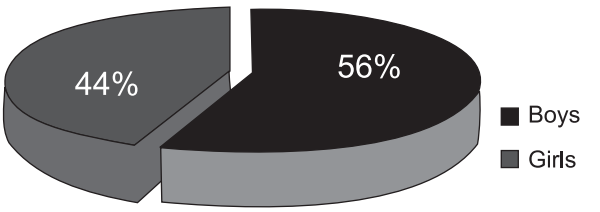

Figure no. 1: Sex wise distribution of children with UTI (n=100)

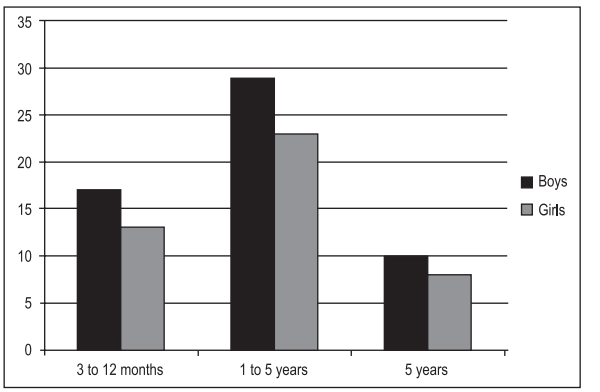

Figure no 2: Age wise distribution of children with UTI (n=100)

(figure no. 1)

The children among age group three months to one year were 30 (30%) girls being thirteen and boys seventeen, among age group one to five years, 52 (52%) twenty three girls and twenty nine boys, among age group above five years were 18 (18%), out of which girls and boys were eight and ten respectively (figure no 2). The youngest was 3 months and the oldest was 12 years old at the time of presentation and /or enrolment. The mean age was 3.7 years.

The main presenting features included fever (61%) , vomiting (38%) , diarrhea (29%), urinary symptoms like difficulty in passing urine or dysuria (26%), crying on micturition and irritability (38%) , frequency of urination (32%) and nonspecific symptoms like weight loss and failure to thrive (37%) and constipation (16%). Patients who presented with non-specific symptoms were suspected to have UTI because of abnormalities found on urinalysis.

The most common urinary pathogens isolated were E.coli (63%), Klebsiella pneumoniae (8%) and Proteus mirabilis (8%). Other pathogens included Pseudomonas auerogenosa (7%), Staphylococcus aureus and Citrobacter 5% each and Enterobacter and Coliform 2% each.

Urine pathogens were isolated most often (52%) in children with ages ranging from 1 to 5 years while those isolated in ages range 3 months of 12 months and above 5 years were 30% and 18% respectively (Table 1)

Table No. 1: Frequency of urinary pathogens isolated in urine of children according to different age group (n=100)

Causative organism	Age rang			Total
	3 months to 12 months	1 – 5 years	> 5 Years	
E. coli	19	35	9	63
Citrobacter	1	3	1	5
Pseudomonas	2	3	2	7
Proteus	2	4	2	8
Klebsiella	5	1	2	8
Staph sureus	1	3	1	5
Enterobacter	0	2	0	1
Coliform	0	1	1	2
Total	30	52	18	100

Table 2: Frequency (percentage) of selected Antibiotics sensitivity of urinary pathogens isolated from children with UTI (n=100)

Antibiotics	E.coli (63)	Klebsiel (8)	Proteus (8)	S. aureus (5)	Enterobact (2)	Pseudomon (7)	Citrobacter (5)	Colifor (2)
Amikacin	53 (84%)	4 (50%)	8 (100%)	1 (20%)	0	7 (100%)	4 (80%)	1 (50%)
Cefixime	31 (49%)	5 63%)	2 (25%)	2 (40%)	0	2 (28.6%)	2 (40%)	1 (50%)
Cefpirome	21 (33%)	1 (13%)	5 (63%)	2 (40%)	0	2 (28.6%)	2 (40%)	2 (100%)
Ceftazidime	20 (32%)	2 (45%)	5 (63%)	0	0	5 (71.4%)	1 (20%)	2 (100%)
Ceftriaxone	31 (49%)	3 (38%)	6 (75%)	2 (40%)	2 (100%)	4 (57.1%)	1 (20%)	2 (100%)
Cephalexin	11 (17%)	0	0	2 (40%)	0	0	0	0
Ciproflox	32 (51%)	5 (63%)	6 (75%)	4 (80%)	0.	5 (71.4%)	3 (60%)	2 (100%)
Coamox	19 (30%)	0	3 (38%)	2 (40%)	2 (100%)	4 (57.1%)	2 (40%)	1 (50%)
Gentamycin	21 (33%)	1 (13%)	1 (12.5%)	0	0	2 (28.6%)	1 (20%)	0
Metopenem	49 (78%)	6 (75%)	6 (75%)	3 (60%)	2 (100%)	5 (71.4%)	3 (60%)	1 (50%)
Nilidix acid	30 (48%)	3 (38%)	1 (12.5%)	2 (40%)	0	3 (42.9%)	3 (60%)	1 (50%)
Sulzone	40 (64%)	5 (63%)	4 (50%)	2 (40%)	1 (50%)	3 (42.9%)	3 (60%)	0
Tazocin	41 (65%)	5 (63%)	2 (25%)	3 (60%)	2 (100%)	4 (57.1%)	4 (80%)	2 (100%)
Tm Sx	4 (6%)	0	0	0	0	0	0	0

Overall sensitivity of urinary pathogens to different drugs is shown in Table 2. Sensitivity of different urinary isolated to Amikacin was highest (82%) followed by meropenem (75%), tazocin (61%) and Sulzone (58%). The least sensitive drug amongst the parent rally administered drugs was shown by Cefpirome and Ceftazidime 35% each and Co amoxicalav, again 35%, amongst the oral drugs. Other drugs to which different urinary isolates were tested for sensitivity included Ciprofloxacin (57%), Ceftriaxone (49%) , Cifixime (45%) and Nalidixic acid(43%).

As shown in table no. 2 the most frequently isolated pathogen, E.coli, was most sensitive to Amikacin in 53 out of 63 cases (84%) followed by metopenem 49 (78%) and Tazocin 41 (65%), Klebsiella to Meropenem in 6 out of 8 cases (75%), and Tazocin, Sulzone, Ciprofloxacin and Cefixime, 5 cases (63%) each; Proteus to Amikacin in all 8 out of 8 cases (100%), and Ceftriaxone, Meropenem and Ciprofloxacin 6 (75%) each, S.aureus to Ciprofloxacin in 4 out of 5 cases (80%) and Meropenem and Tazocin 3(60%) each; enterobacter sp isolated in 2 cases, in both cases it was resistant to

Cefixime, Cefpirome, Ceftazidime, Nalidixic acid and Ciprofloxacin; Pseudomonas to Amikacin in 7 out of 7 cases (100%), and Ceftazidime, Ciprofloxacin and Meropenem 5 (71%) each; Citrobacter to Amikacin and Tazocin in 4 out of 5 cases (80%), and Nilidixic acid, Ciprofloxacin, Sulzone and Meropenem 3 (60%) each.

Coliform Isolated in 2 cases, in both of which (100%) was sensitive to Cefpirome, Ceftazidime, Ceftriaxone, Ciprofloxacin and Tazocin; it was resistant only to Sulzone. 37 boys (66%) with urinary tract infection were circumcised.

DISCUSSION

The goals of treatment of urinary tract infection are to eliminate the pathogen, to prevent urosepsis, and to reduce the risk of renal scarring[3]. Epidemiology and resistance patterns of bacterial pathogens in pediatrics urinary tract infection show large interregional variability, and rates of bacterial resistances are changing due to different antibiotic treatment[4]. Knowledge of spectrum of pathogens and their patterns of drug resistance is indispensable for the empirical section of an effective therapeutic agent prior to availability of culture result[5]

Most of the infections were observed in the male patients with an overall male to female ratio of 1.2:1. Male outnumbered females by a smaller proportion amongst all age groups. The epidemiology of UTI during childhood varies by age, gender and other factors. The incidence of UTI is highest in the first year of life for all children (1%) but decreases substantially among boys after infancy[6]. The predominance of males among children affected with acute UTIs in this study is not consistent with many previous reports[7,8,9], where females, except during infancy, are more affected than the males. Reason for this may be the smaller sample of children studied.

E.coli is responsible for the vast majority of UTIs, especially in infants and young children without a known urinary tract malformation. As expected, E.coli is still the major causative organism in pediatric urinary tract infections as affirmed in this study accounting for 63% of all cases, followed by Klebsiella spp. (5%), enterococcus spp (2%), and Coliform (2%) and these results are comparable to those reported by others earlier[10,11,12].

In our study, urinary tract infection is highly prevalent amongst the age group one to 5 years. As reported in literature[13], initial episodes of urinary tract infection occur more commonly in infancy, when the renal parenchyma is highly susceptible to the injurious effect of infection and is at greatest risk of development of cortical scarring[14].

The development of cortical scarring does not decrease with age and this study has a considerable effect on recommendations for the initial treamtment of urinary tract infection among febrile children prior to availability of culture results.

In my study, sensitivity of different urinary isolates to Amikacin was highest followed by Meropenem, Tozocin and Sulzone. Higher resistance rate to all antibiotics used in this study with the exception of amikacin, sulzone, (cefoperazone + sulbactam), meropenem and tazocin (piperacilin + tazobactam) may be explained by widespread and injudicious use of antimicrobial agents during the past decade in our region. A comparison of our results with those of recent pediatric studies from the Turkey[15], India[16], Germany[17] and Yeman[9], shows a broadly similar picture.

Resistance among uropahtogens to a variety of antibiotics is increasing. Prior studies[18], have shown increasing rates of resistance to gentamicin, cotrimoxazole and first-generation cephalosporins. Our study also found high rates of resistance to all of these antibiotics. More than 50% of uropathogens of this study are resistant to those antibiotics once considered to be the best oral substituties to injectables i.e. nalidixic acid and amoxicillin + clavulanate.

In the present study, only four antibodies, amikacin, sulzone, meropenem and tezocin, have least resistance. There was a significant resistance to third generation cephalosporin. It is possible that this patient population may have had pervious exposure to third generation cephalosporins. Other studies have shown that prior exposure to an antibiotic leads to the development of organisms resistant to that antibiotic[19]. The emergence of antibiotic-resistant strains is multifactorial and that could be explained by several non exhaustive hypotheses. The influence of excessive and /or inappropriate antibiotic use, particularly of broad-spectrum agents prescribed empirically, has been demonstrated.

The presenting symptoms of UTI in infants and preschool children were non-specific and included fever, failure to thrive, diarrhea, vomiting, poor feeding and irritability. After the age of 3 year the classic symptoms of UTI, namely dysuria, frequency and fever were the main presentations. In my study, fever was the most common symptom and 60% had history of fever. Other studies[1,20,21,22,23] also indicate the high association between fever and urinary tract infection. Failure to thrive was common in this study as compared to study from Kuwait[24] but similar to a study from this area[23]. Underlying malnutrition with recurrent infection and poor intake has been blamed for it[25].

Dysuria was a common presentation in older children (26%) but it can also be presenting symptoms in the infants[24,25]. Pain abdomen is also non-specific symptoms in the children studied, included vomiting and diarrhea, comparable to a local study[26].

Circumcirsed males appear to be at lower risk for developing UTI perhaps because of low per urethral and urethral bacterial inoculums[27,28]. This is different from my findings.

Sixty six percent of male patients were circum-

cised. This may be due to the small number of males included in the study.

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