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ORIGINAL ARTICLE

Frequency of culture positive urinary tract infection in febrile children.

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ABSTRACT… Objective: To determine prevalence, causative organisms and sensitivity patterns of urinary1tract infections in febrile children. **Study Design:** Cross Sectional study. **Setting:** National Institute of Child Health, Karachi. **Period:** Jan 2019 to July 2019. **Material & Methods:** Patients from 3.0 to 14.0 years of age of either sex with complain of fever of >37.5 C for less than 2.0 weeks were included. Patients who have life threatening conditions, chronically ill, received antibiotics within 48 hours or had structural abnormalities of urinary tract like posterior ureteral valves and children with renal failure were excluded from study. Urinary sample was collected following aseptic measures of febrile children ad was sent to lab for culture and sensitivity within one hour of its collection. Sensitivity pattern was measured in lab via disc diffusion method. Data was analyzed using SPSS version 22. **Results:** The mean age was 8.6±3.3 years out of which 115 (65.7%) were male and 60 (34.3%) were females, mean duration of illness was 8.7±3.1 days. The frequency of culture positive UTI in febrile children was 21 (12%) cases. The common pathogen isolated from the urine culture was E. coli found in 10 cases followed by Klebsiella oxytoca. Overall 70% of E. coli are sensitive to. gentamicin and amikacin, 50% were sensitive to third generation cephalosporin, 60% of Klebsiella are sensitive to third generation cephalosporin, 60% resistant to gentamicin and amikacin and 80% were resistant to ampicillin. **Conclusion:** It was concluded from this study that the frequency of culture positive urinary tract infections in febrile children was 12% and common pathogen was E.coli followed by klebsilla oxytoca.

Key words: Febrile Children, Pathogens, Sensitivity, Urinary Tract Infection.

INTRODUCTION

Urinary tract infections (UTI) can be defined by presence of significant quantity of bacteria in the urine along with symptoms of infections.[1] It is a common serious illness in febrile infants and young children which can contribute to permanent renal damage in children. The common bacterial infections in children are urinary tract infections (UTIs) which occur often in the first 3 years of life.[2] In girls, UTI occurs at a rate of 3 to 5 percent compared to 1 to 3 percent in boys.[3] Males have a greater incidence of UTI in babies than girls due to a higher incidence of obstructive urinary tract abnormalities in boys. However after a year, females had a lower rate of UTI because females have a smaller urethra and have a higher risk of vaginal contamination with faecal bacteria. UTIs are more common in girls than in boys. Uncircumcised boys are more likely to develop UTI.[4] According to the research, fever is a common clinical indication of UTI in infants.[5]

Several studies have found variable rates of UTI in children, ranging 1 from 3.29% in the United States to 37.4% in Pakistan. The clinical characteristics of a urinary tract infection differ depending on the age at which it occurs. Fever, jaundice, vomiting, poor feeding, irritability and weight loss are common symptoms and indicators in newborns and babies. Fever is the most prevalent symptom of UTI in children with up to 91 percent reported.[6]

Eighty percent of the babies who had a UTI confirmed by culture had a fever.[1] Children's UTIs can develop in conjunction with other infections. Clinical features are unclear and nonspecific in infants so the diagnosis of UTI is missed by most pediatricians. Despite different available

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guideline for diagnosis and management of UTI it is still the challenge for physicians that lead to mis-diagnosis followed by ill health and kidney damage.[7]

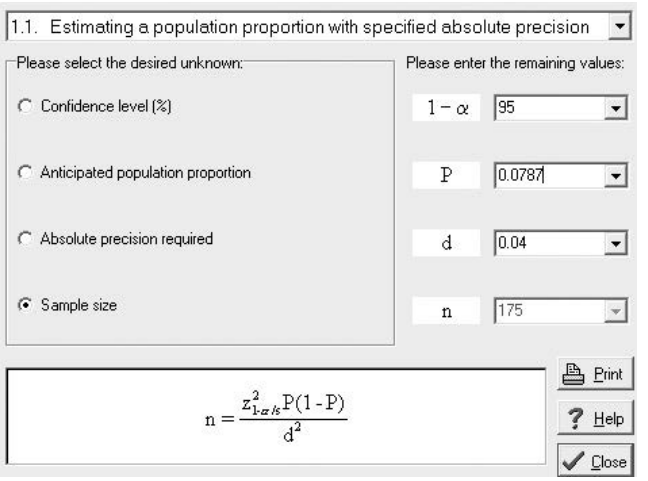
UTI was found in 110 of the 3625 children examined at the centre throughout the research period resulting in a case frequency rate of 3.0%. Most of the patients 59(53.5%) were under the age of two. Fever was the most common presenting symptom, whereas Klebsiella 27(24.4%) and Staphylococcus aureus were the most common pathogens isolated in urine 24 (21.8%).[8]

Gram negative bacteria, which are found in faecal matter and populate the perineum, are the most common bacteria that cause UTI in children.[9] The uropathogens sensitivity patterns are increasing, providing an increasing issue in the empiric therapy of UTI in children. The WHO-recommended first-line treatments for urinary tract infections amoxicillin and cotrimoxazole, are no longer effective.[10]

The rationale of this study is recognizing underlying pathogens causing UTI as it is important to avoid long term sequelae like kidney scarring, hypertension and chronic kidney failure. Due to use of antibiotics the pathogens develop resistance to common antibiotics used to treat UTI like septran, nalidixic acid, fosphomycin. The purpose of this study is to determine the frequency of UTI in febrile children, as well as the isolation and sensitivity of pathogens in urine and to analyse the demographic differences between cases with and without UTI. The findings of the study will help us in prioritising antibiotic treatment in children with UTIs in order to avoid long - term kidney damage.

MATERIAL & METHODS

This cross sectional study was conducted in National Institute of Child Health, Karachi from Jan 2019-July 2019. ERC number CPSP/REU/PED-2011-196-2243. Taking the prevalence of UTI of 7.87%9, 95% confidence interval and 4% bond on error of estimation the sample size was 175.



Inclusion Criteria

The research included patients aged 3 to 14 years old, of either gender, who had a fever of more than 37.5 degrees Celsius for less than two weeks.[14,15]

Exclusion Criteria

Patients who were in life threatening conditions, chronically ill, received antibiotics within 48 hours or had basic abnormalities of urinary tract like posterior ureteral valves, congenital vesicoureteral reflex, pelviuretric junction obstruction, children with renal failure were excluded. [14,15]

The doctor explained purpose, process, risks and benefits of the study to the parents. Parents were also being ensured for the confidentiality of the information obtained from them. Urinary sample of febrile children were sent for culture and sensitivity. Urine was collected aseptically and delivered to the lab within an hour of being collected. The samples were stored in refrigerator if delay in sample delivery to lab. Sensitivity pattern was measures in lab via disc diffusion method.

Data were analyzed on SPSS 22.0 version. Age and duration of disease was presented by mean+ SD, gender, UTI causative organisms and sensitivity patterns were presented as frequency and percentage.

The Chi square test was used to control effect modifiers such as age, gender, and illness

duration. P-value1<10.05 was considered as significant.

RESULTS

A total of 175 patients were included. The mean age was 8.6±3.3 years and 71 (40.57%) children were between 5-10 years of age. There were 115 (65.7%) male & 60 (34.3%) female. The average duration of illness was 8.7±3.1 days and 97 (55.4%) had duration of illness ≥7 days. The frequency of culture positive urinary tract infections in febrile children was 21 (12%) cases. Table-I

Stratified analysis of frequency of culture positive urinary tract infections in febrile children by age, gender and duration of illness were as follows. The frequency of culture positive urinary tract infections in febrile children was 11 (15.5%) compared to 5 (8.1%) cases among children of age >10 years (p-0.421). Of male children, the frequency of culture positive urinary tract infections in febrile children was 7 (6.1%) compared to 14 (23.3%) cases among female children (p-0.001). The frequency of culture positive urinary tract infections in febrile children was 9 (11.5%) compared to 12 (12.4%) cases among children with duration of illness ≥7 days (p-0.529). Table-II

The common pathogen isolated from the urine culture was E. coli accounting for 10 cases followed by Klebsiella oxytoca. Figure-1. Overall 70% of E. coli are sensitive to gentamicin and amikacin, 50% sensitive to third generation cephalosporin. Table-II. 60% of Klebsiella are sensitive to third generation cephalosporin, 60% resistant to gentamicin and amikacin and 80% resistant to ampicillin. Table-III Sensitivity pattern of all other gram negative organisms are summarized in Figure-2.

		Frequency (%)
Age (years)	Mean+ SD	8.6±3.3
	<24	42(24%)
	5-10	71(40.57%)
	>10	62(35.43%)
Gender	Male	115 (65.7%)
	Female	60 (34.3%)
Duration of illness (Dyas)	Mean+ SD	8.7±3.1
	<7 days	78(44.57%)
	>7 days	97(55.43%)
UTI	Positive	21(12%)
	Negative	154(88%)

Table-I. Distribution of age, gender & duration of illness

		Culture Positive		P-Value
		Yes	No	
Age in years	< 5	5(11.9%)	37(88.1%)	0.42
	5-10	11(15.5%)	60(84.5%)	
	>10	5(8.1%)	57(91.9%)	
Gender	Male	7(6.1%)	108(93.9%)	0.001
	Female	14(23.3%)	46(76.7%)	
Duration of Disease (Days)	< 7	9(11.5%)	69(88.5%)	0.529
	>7	12(12.4%)	85(87.6%)	

Table-II. Frequency of culture positive UTI in febrile children by age, gender & duration of disease

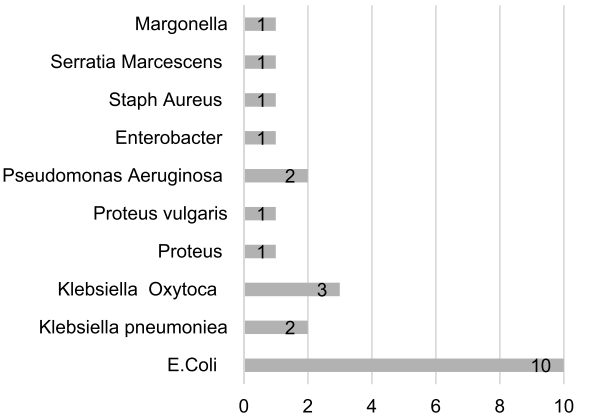


Figure-1. Frequency of pathogens isolated from urine (N=21)

	E. Coli			Klebsiella		
	Sensitive	Resistant	Intermediate	Sensitive	Resistant	Intermediate
Ampicillin	3	6	1		4	1
Ceftaqzidime	5	5		3	2	
Cefixime	5	4	1	3	2	
Ceftriaxone	5	4	1	3	2	
Gentamycin	7	3		2	3	

Table-III. Sencitivity Pattern : E.Coli & Klebsiella

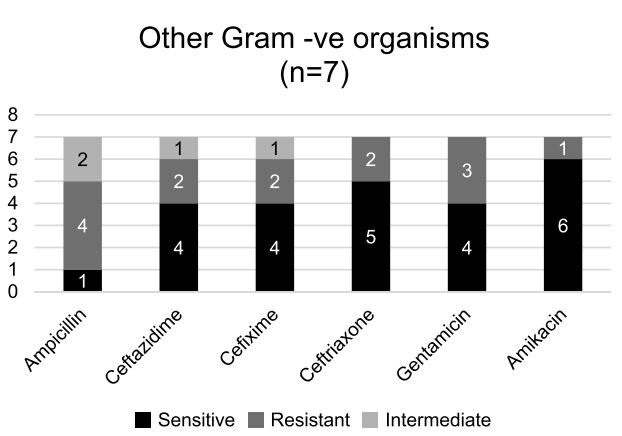


Figure-2. Distribution of sensitivity pattern: Other Gram Negative Pathogens

DISCUSSION

Urinary tract infection (UTI) is the common, bacterial infection in childhood[13,14], recurrent infections affect up to 30 percent of babies and children.[15] Although normal architecture is common, UTIs may have been the sentinel event indicating underlying kidney abnormalities. Early diagnosis and beginning of treatment is important in preventing long-term kidney scarring.[16] Recognizig UTI in initial stages is importent as missed diagnosis can lead to disastrous effect including renal scarring, Chronic kidney damage and hypertension.For treating Urinary tract infection properly it is of utmost importance that organism should be cultured and local sensitivity pattern should be obtained.[17]

Urinary tract infections are not widely recognized as a cause of childhood disease. Urine culture has the problem of taking 48 hours to get a result. As a result, early diagnostic procedures for UTI identification are excellent in children, with dipstick testing and urine microscopy being the most often used rapid tests. The dipstick includes chemical analysis of nitrite, leukocyte sterase, blood and protein. Dipstick tests have the advantage of being quick and easy to administer, and they can offer an instant response. The microscopic examination of urine for leukocytes or bacteria is also critical in the diagnosis of Urinary1tract infection.[17] Clinicians only order urine culture findings if they are concerned about urinary tract infection. Although methods for identifying children with a high risk of UTI have been developed, they are not routinely used by doctors.

Urine samples account for the majority of the samples analysed in standard diagnostic labs. Wet mount microscopy, dipstick and automated tests are among the quick diagnostic procedures available, however quantitative urine culture is the gold standard for UTI detection.[18] Bacterial growth on culture media can take up to 18 hours under standard laboratory procedures, which implies diagnosis is uncertain for the first 24-48 hours following presentation, causing therapeutic delays.[19] Furthermore, urine culture is an expensive technique that requires the use of a well-equipped microbiology laboratory staffed by knowledgeable personnel.

Reagent strip testing of urine samples on the other hand is a method for detecting infection early in the emergency room and initiating treatment sooner.[20] Reagent strips are used to test for infection indicators. To test urine samples for urinary tract infections, two indicators, leukocyte esterase and nitrite, have been integrated on one dipstick.[21]

Rapid diagnostic tests can rule out urine infection and are affordable, time-consuming and cheap making them suitable in small laboratories without a culture facility. They can also diagnose both severe and mild UTIs faster than culture. Because a dipstick test does not require a sterile urine sample. It is simple to collect a sample particularly in youngsters, using a non-invasive method. The dip stick technique of diagnosing UTI does not need the use of experienced personnel or a well-equipped laboratory.[22]

The cut off to diagnose UTI as per American academy of pediatrics is 10,000 CFU/ml. It is also important to distinguish between contamination and true pathogens. Patient can also present with asymptomatic bacturia which can be confirmed by suprapubic catheterization as majority of them do not require treatment.[22] uncircumised males are eight times at higher risk for getting urinary tract infection. Female are more prone to Urinary

tract infections cause being genetic tendency as lack of secretion of carbohydrate that prevent adherance of organism to urinary tract.

Length of treatment as per American academy of pediatrics is 7-14 days in aged 2 months to 2 years of age children. It is also important to follow child after treating for urinary tract infection. Since 1960, VCUG was being used as a routine contrast study or in conjunction with a radionuclide. Normally, the difference study is chosen than radionucleotide cystogram for the first study due to its quality of being giving greater anatomic details. Some investigations have demonstrated that a radionucleotide scan has a higher sensitivity. Whereas still this debate exists regarding the timing of a VCUG study, it is generally agreed that the procedure can be carried out after the infant is afebrile, healthy and has a negative urine culture. When the VCUG is performed soon after a urinary tract infection, compliance tends to be better. Although no test is perfect, the VCUG's capacity to detect reflux has been challenged. However, there have been many debates about whether routine VCUG work-up is the ideal technique for improving long-term outcomes, because there is not enough evidence to back up the use of preventive antibiotics once reflux is detecte. More research is needed to demonstrate the benefits of preventive antibiotics and VCUG as a follow-up treatment.[22]

In addition to this, Recent study has revealed the presence of renal scarring even when there is no reflux, which has lead to interest in newer imaging methods.[23]

Recent studies reporting on followup of these patients being evaluated during a febrile UTI document initial defect and subsequent scarring in 34 to 70% and 9.5 to 38%, respectively. However, there are not enough studies in the literature with proper follow-up to assess the true incidence of scarring, as it has been shown that Defects can change up to 6 months after a urinary tract infection. In kidney scans, there is also the possibility of interobserver variability, with variances ranging from minor to significant.[24] The level of renal scarring for the risk of long-term1morbidity like hypertension and chronic renal failure is not well documented. The most certain clinical condition is when a renal scan is performed during an acute UTI and no abnormality is found; These children do not appear to be at risk for additional scarring, thus avoiding anatomic testing may be suitable in this case. However, more monitoring with long-term follow-up is required before doctors feel confident in utilizing a DMSA scan as the primary study to determine1further management in a child with a first UTI.[24]

Urinary tract infections are classified as one of three categories, depending on which part of the urinary system is affected. Different parts of the urinary system may be affected by a urinary tract infection. The first is urethritis, a condition in which the urethra, the narrow tube Infection develops in the tube that drains urine from the bladder to the outside of the body. Cystitis is the second form, which is characterized by a bacterial infection in the bladder that has often spread up from urethra. The third form is pyelonephritis, which is a kidney infection caused by an infection that has moved up the urine tract or by a blockage in the urinary tract.[23]

The most frequent bacterial infection in children is urinary tract infection. It might be an early clinical manifestation of congenital abnormalities of the kidney and urinary tract in children, or it can be linked to bladder dysfunctions. 80-90 percent of community-acquired1acute pyelonephritis episodes, especially in children, are caused by E. coli.[24] Innate human defense systems and bacterial virulence factors may have a role in the prevalence and severity of urinary tract infection.

The relevance of UTI has become more recognized during the last several decades particularly its function as an occult1cause of febrile disease in children. As a result, a larger approach to showing may be required. In two earlier studies, the incidence of UTI in children coming to emergency room with a fever ranged from 3.4 to 5.4%.[25] In addition to age, gender and other characteristics, the epidemiology of UTI in children differs.

In this study, the most often isolated organism was E. coli, which was followed by Klebsiella, pneumonia. E. coli was a regularly reported bacterium in Yemeni studies, and a research done at Ayub Teaching Hospital in Yemen found similar results to ours. A reduced percentage of E. coli and a greater infection with klebsiella and proteus have been reported in a few investigations. Two male individuals were used to isolate Proteus.[24]

The E. coli was sensitive to aminoglycosides (70%) and third generation cephalosporin (50%) and resistant to ampicillin. Similarly, a study in okarska reported E. coli were sensitive to aminoglycosides as well as third generation cephalosporin.[25]

In this study there were few limitations. First, apart from fever, we did not ask about clinical history like dysuria, abdominal pain, and diarrhea, second, we did not urine examination, Nitrite, leukocyte esterase, glucose, and blood dipstick tests are quite beneficial. A positive dipstick test for leukocyte esterase and nitrite is particularly sensitive for detecting UTI. A test which is negative for leukocyte esterase and nitrite is very specific for discarding UTI. Third, we did not investigate other causes of fever.

CONCLUSION

In conclusion, there is a high frequency of UTI among febrile children, which is predicted by female sex and longer illness duration. Gram-negative organisms are UTI common pathogens, and the majority of them are sensitive to aminoglycosides and third-generation cephalosporins.

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