ORIGINAL ARTICLE

Bacterial Pathogens in Pediatric Urinary Tract Infections: A Surveillance Study

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[1]Conducted the study ,Data collection and manuscript writing
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ABSTRACT

Objective: To determine the distribution of microorganisms causing urinary tract infections in children.

Study design: Descriptive cross sectional study

Place and Duration of study: Study was conducted from October 2015 to April 2016 at Pediatric Department, Combined Military Hospital Multan.

Patients and Methods: One hundred and fifty one Children between age groups >28 days to 12 years of both gender with UTI were included in the study. Urinary tract infection was diagnosed on the basis of a positive urine culture report. Among positive urine culture results, the frequency of different microorganisms was calculated. Data was analyzed using SPSS version 20. Descriptive statistics were used to calculate qualitative and quantitative variables. Qualitative variables like gender, microorganisms were measured as frequencies and percentages. A quantitative variable like age was measured as mean and standard deviation.

Results: Age range in this study was from > 28days to 12 years with a mean age of 4.149 ± 2.92 years. 38 (25.2%),64 (42.4%),49 (32.5) patients were from age group 29 days to 1 year, >1 year to 5 years and >5 years to 12 years respectively. Out of 151, 58 (38.4%) patients were males and 93 (61.6%) females. E. coli was seen in 106 (70.2%) patients. Klebsiella was seen in 22 (14.6%) patients. Proteus was seen in 15 (9.9%).

Conclusion: Frequency of microorganisms causing urinary tract in children in this study was not significantly different from that of other developing and developed countries.

Keywords: Urinary tract infection, Children, Microorganism.

Introduction

Urinary tract infection (UTI) is one of the most common medical conditions affecting millions of children every year. Because of advanced immunization for many bacterial infections, the urinary tract is currently the most frequent site of the occult and serious bacterial infections in children.[1]

Prevalence rates of UTI in children vary by age, gender, race, and circumcision status. Uncircumcised male infants less than 3 months of age and females less than 12 months of age had the highest prevalence of UTI. Among infants presenting with fever, the overall prevalence of UTI is 7.0%. The pooled prevalence rates of febrile UTIs in females aged 0-3 months, 3-6 months, 6-12 months, and >12 months was 7.5%, 5.7%, 8.3%, and 2.1% respectively. Among febrile male infants less than 3 months of age, 2.4% of circumcised males and 20.1% of uncircumcised males had a UTI. Among older children (<19 years) with urinary symptoms, the pooled prevalence of UTI was found to be 7.8%.[2] The cumulative incidence in the first 6 years of life is 7% in girls and 2% in boys.[3] Febrile urinary tract infections have the highest incidence during the first year of life in both sexes.[4]

In the evaluation of febrile infants with no recognizable source of infection, occult bacteremia is a major concern for clinicians. The urinary tract is now being considered as the most frequent site of the occult and serious bacterial infections after the introduction of effective vaccines against Haemophilus influenzae type b and Streptococcus pneumoniae. Diagnosis of urinary tract infections in children is sometimes delayed because of non-specific clinical presentation and difficulty in obtaining reliable

urine specimens for culture. For the collection of proper specimens in children, one has to use invasive methods like urethral catheterization or suprapubic aspiration. Subsequently, there is a delay in the institution of appropriate treatment for UTI resulting in various complications like pyelonephritis and renal failure.[1]

Studies conducted to determine the etiology of urinary tract infection in children showed that Escherichia coli was the most common uropathogen.[5] In a recent study, the most frequently cultured pathogens included Escherichia coli (72.7%) and Klebsiella (8.3%).[6]Local data showed E. coli to be the most common organism isolated (71%), followed by Klebsiella (13%) and Proteus (11%).[7]

Urinary tract infection (UTI) is of great clinical importance owing to considerably high morbidity and mortality rates among children. Urinary tract infection is a frequently occurring clinical problem in childhood and generally presents with non- specific symptoms. It can lead to complications like renal scarring, arterial hypertension and end stage renal disease. The rationale of doing the study is to facilitate the understanding of causative microorganisms in different age groups and genders. It can help in timely diagnosis and proper management, thus preventing long term morbidity.

Methodology

This descriptive cross sectional study was conducted in the Pediatrics Department Combined Military Hospital Multan (CMH) in collaboration with the department of pathology from October 2015 to April 2016. Sample size was calculated using WHO sample size calculator with a confidence level of 95 % and absolute precision (margin of error) of 5%. The anticipated population proportion was 11% as reported by a study conducted in Abbottabad.[7] The total sample size was **n= 151**. Patients were selected through non probability consecutive sampling.

Children both male and female between age groups >28 days to 12 years with UTI were included in the study. Children with primary immunodeficiency, lymphoproliferative disorders or treated with steroids and chemotherapy were excluded.

After taking verbal consent from parents, the patients from the pediatric department CMH Multan (both outdoor and indoor) fulfilling the inclusion criteria after complete history and examination were included in the study. Urine samples were collected with a clean catch technique or catheterization whichever was appropriate according to the age of the child. Samples were sent to Pathology Laboratory CMH Multan and microorganism growth was assessed on the basis of colony morphology, count and Gram staining. Organisms were identified by API.20e (Biomerienx).

Among positive urine culture results, the frequency of different microorganisms was calculated. Data was analyzed using SPSS version 20. Descriptive statistics was used to calculate qualitative and quantitative variables. Qualitative variables like gender, microorganisms were measured as frequencies and percentages. A quantitative variable like age was measured as mean and standard deviation. Effect modifiers like age, gender were controlled by stratification.

Results

Age range in this study was from > 28days to 12 years with a mean age of 4.149 ± 2.92 years. 38 (25.2%),64 (42.4%),49 (32.5) patients were from age group 29 days to 1 year, >1 year to 5 years and >5 years to 12 years respectively as shown in Table -I. Out of 151, 58 (38.4%) patients were males and 93 (61.6%) females.

Table- I: Percentage of patients according to Age distribution (n=151)

Age Groups	Patients	%age
29 days to I year	38	25.2%
>1 year to 5 year	64	42.4%
> 5 year	49	32.5%
Total	151	100%

E.coli was seen in 106 (70.2%) patients. Klebsiella was seen in 22 (14.6%) patients. Proteus was seen in 15 (9.9%).

In age group 29 days to 1 year, 27(71%) had E-coli, 4 (10.5%) had Klebsiella and 5 (13.2%) had Proteus species as the causative organism of UTI. In age group >1 year to 5 years, 48 (75%) had E-coli, 5 (7.8%) had Klebsiella and 6 (9.4%%) had Proteus species as the causative organism of UTI. In age group >5 years, 31(63.3%) had E-coli, 5 (7.8%) had Klebsiella and 6 (9.4%%) had Proteus species as the causative organism of UTI.

Among 93 female subjects with UTI, 66 (71%), 13 (14%) and 9 (9.7%) had E-coli, Klebsiella and Proteus as causative organisms respectively. Among male subjects, 40 (69%), 9 (15.5%) and 6 (10.3%) had E-coli, Klebsiella and Proteus as causative organisms respectively.

Table- II: Stratification of E.coli with respect to age groups.

		E.coli		
	Age	Yes	No	p-value
1	29 days to 1 year	27 (71.1%)	11 (28.9%)	0.398
2	>1 year to 5 years	48 (75%)	16 (25%)	

3	>5 years	31 (63.3%)	18 (36.7%)	
Total		**106 (70.2%)**	**45 (29.8%)**	

Table III: Stratification of E.coli with respect to gender

		E.coli		
Gender		**Yes**	**No**	**p-value**
1	Female	66(71%)	27(27%)	0.794
2	Male	40(69%)	18(31%)	
Total		**106 (70.2%)**	**45 (29.8%)**	

Discussion

The current study showed E.coli was seen in 106 (70.2%) patients, Klebsiella was seen in 22 (14.6%) patients, Proteus was seen in 15 (9.9%) patients, which makes E. coli the most common organism causing UTI in children followed by Klebsiella. The age group affected the most was from 1 year to 5 years (42.4%).

These findings are in agreement with most of past studies [8-12] over the subject. It is already known that UTI incidence in boys exceeds that of girls in the first few months of life; however, this sex-related dominancy would change toward girls by end of first year and there-after.[13,14] Based on epidemiological data on neonatal UTI, this boys-to-girls incidence ratio estimated as 2 to 1.[14] Current study 61.6% frequency of UTI among girls comes to a girls-to-boys ratio of 1.60, which is compatible with a fore-seeable higher incidence of UTI in girls after 1 year age.[15]

My study results are compatible with a recent study, in which the most frequently cultured pathogens included Escherichia coli (72.7%) and Klebsiella (8.3%).[6] Local data showed E. coli to be the most common organism isolated (71%), followed by Klebsiella (13%) and Proteus (11%).[7]

Our results are also compatible with various international studies. One of the studies carried out in Taiwan showed E. coli as most common organism causing UTI in children (81%) followed by Klebsiella pneumonia (6.5%).[16] On an overview of previous studies, *E. coli* has been reported as the leading uropathogen in neonates with UTI with various relative frequencies: 80.5% in Qazvin,[17] 76.5% in Tehran,[18] 76.3% in Tehran,[19] 50% in Kashan,[20] and 50% in Uromia.[21]

Our study did not include the neonatal age group. In comparison to other age groups, continuous assessment of uropathogen epidemiology in the neonatal period is of profound significance, as UTI is hard to diagnose at this age group and could potentially lead to systemic infection leaving potential life threatening and long term sequel. Moreover, this would enable clinicians to choose an empirical therapy regimen that is most clinically and epidemiologically ideal till further microbiologic results are available. Furthermore, it is an accepted practice that neonatal divisions take into account the prevailing antibiotic sensitivities of local bacterial isolates before opting an empirical regimen.[22] Having said all these, to our knowledge, this is an area which has least been under the attention of neonatal divisions across the country.

Our results only included the frequencies and age/gender-based stratification of three most commonly cultured bacterial organisms. So, another extensive study must be carried out to include the other organisms like Enterococcus, Staphylococcus saprophyticus, staphylococcus epidermidis candida, etc. The study is deficient in providing the data about the sensitivity of cultured organisms to various antibiotics. Recently observed resistance patterns towards antibiotics commonly being used in empirical therapy of neonates with UTI and or sepsis, namely ampicillin along with aminoglycoside or a third-generation cephalosporin, have raised concern over the efficacy of current treatment protocols and even the need for changes in present regimens. Resistance towards ampicillin has been reported by many studies. However, there are few studies assessing the susceptibility pattern of UTI organisms towards a wide spectrum of antibiotics.[22-24]

Conclusion

Frequency of microorganisms causing urinary tract in children in this study was not significantly different from that of other developing and developed countries, however it will help us a lot in speedy diagnosis and empirical treatment of our pediatrics patients with UTI. Emphasis also required in parental counseling on preventive measures like behavioral modification and management of predisposing factors.

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