ORIGINAL ARTICLE

Causative Organisms of Urinary Tract Infection and their Sensitivity Pattern in Children

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Author`s Contribution

[1]*Conceived the topic of research and designed the study*
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[3,4]*Data Analysis and Discussion*

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ABSTRACT

Objective: To determine the pattern of different causative organisms in urinary tract infection and their antibiotic sensitivity pattern among children.

Study duration and setting: Study was completed in Six months i.e. from June to December 2015 in department of Pediatrics, Shaikh Khalifa Bin Zayed Al-Nahyan Hospital, Muzaffarabad.

Methodology: A total of 370 children with suspicion of urinary tract infection were included. Mid-stream, clean catch specimens were collected in a sterilized container. Urine sample was delivered to laboratory immediately for detection of causative organism. Susceptibility testing was carried out to routinely used antibiotics. Data was entered and analyzed on SPSS 20.

Results: The mean age was 5.42 ± 2.043 years ranged from 2 to 9 years. There were 200 (54.1%) female patients. The causative organisms responsible for urinary tract infection were E Coli (47.6%) followed by Klebsiella (23.2%) and Proteus (10%), Staphylococcus was found in (7.3%) and Enterobacter in (7.3%) children, and rest (4.6%) were effected with other organisms. Meropenum 286 (77.3%) and Ceftazidine286 (77.3%) showed highest sensitivity and lowest resistance pattern followed by Levofloxacin 285 (77.0%), Imipenem 284 (76.8%) and Amikacin 279 (75.4%) respectively. There was no statistically significant (p-value > 0.05) association of age and gender with organism responsible for UTI.

Conclusion: E Coli is more common causative organism for urinary tract infection followed by Klebsiellaand Staphylococcus. Highest sensitivity pattern was found with Meropenem, Ceftazidine, Levofloxacin, Imipenem and Amikacin.

Keywords: Urinary tract infection, E Coli, antibiotic sensitivity, Co-amoxiclav.

Introduction

Urinary tract infection is among very common sites of infection in infants and young children. This infection is frequently observed among pediatric age and is a challenge for pediatric healthcare givers. Most commonly seen infection in children is respiratory tract infections followed by urinary tract infection, which has got significant importance during recent decades because it

has become a major cause of febrile illness in young children. [1]

Existence of substantial number of bacteria in the urine with signs and symptoms of infection can be categorized as UTI. [2]Early diagnosis and management can prevent further complication like bacteraemia which can be life threatening. Incidence of severe morbidity and bacteraemia which can be intimidating for young children, can be prevented by early and proper diagnosis and treatment of UTI. [3]

UTI is considered as a quite frequently occurring disease in children. It is estimated that about 8% girls and 2% boys present with UTI during their childhood. It has quite high recurrence rate and 30-40% children present with recurrence within two years. It can be symptomatic or asymptomatic and can cause severe complications which can be fatal for children and in some children it can produce sepsis and pyelonephritis in pediatric age.[4,5]

The main causative factors of UTI are influenced by time, age of the patients and geographical location with considerable variation among them.[6]Any organism present in the urinary tract can be a cause of UTI but most common organisms belong to enterobacteriaceae family containing facultative anaerobic, gram negative organisms. The role of antibiotics is very crucial in UTI like any treatment of infection. [7-9]Therefore wise choice of antibiotic is very essential and depends upon previous history of medicines used or any other illness, the details of sensitivity pattern of antibiotics, previously recognized etiological organisms, pharmacokinetics along with its toxicity and age of the patients. [10]

The use of antibiotics has increased extensively these days and this intense expansion in use of antibiotics have significantly intensified the antibiotic resistance. The resistant patterns have greater variation in frequency with respect to localities and age groups. The organisms which cause UTI have shown multidrug resistance in many researches. [11-15]

Urinary tract infections in pediatrics age need more profound management in the sense of prompt diagnostic record and initiation of proper treatment with appropriate antibiotic therapy and for an appropriate duration. Recent studies have identified enterobacteriaceae strains as prevailing bacterial organism isolated from urine culture. Some studies have shown E coli as most frequent pathogen found in cultures of community acquired UTI cases. The second most common pathogen found in these cases was Klebsiella.[8,9] Similar results were found in another study in which E. coli was reported as the most common etiological agent of UTI (65.2%), followed by Klebsiella spp. (26%), Pseudomonas aeruginosa (3.6%), and Staphylococcus coagulase positive (3.7%). [16]

The knowledge of spectrum of urinary pathogenic bacteria and their susceptibility pattern is very essential for any physician to identify the most suitable antibiotic treatment in pediatric UTI. So the present study was planned to determine the frequency of different bacterial pathogens causing UTI and their susceptibility patterns to commonly used antibiotics in the study population to help physicians about choosing the most appropriate antibiotic when treating a UTI in children in this area.

Material and Method

Approval was taken first from the hospital ethical review committee before conducting the study. Informed consent was taken from the parents or the guardian. Children were recruited through the OPD, Accident and emergency and In-patients department of Shaikh Khalifa Bin Zayed Al-Nahyan Hospital, Muzafarabad. After taking relevant history, relevant clinical examination was done. Urinary tract infection was diagnosed on the basis of colony count of 10^5/ ml of single pathogen or if there were 10,000 colonies and the child was having symptoms. In uncooperative and morbid children the urine was also collected through urinary catheterizationand suprapubic tap,

The sample will be sent to the laboratory as soon as possible within 1 hour of collection. If in some situation it was not possible then the sample was kept at 4^{O}C and maximum it will be analyzed within 6 hours. The MacConkey's media and 5 % sheep blood agar was used to culture the urine sample and for incubation 0.001 ml loop was used. The anaerobic growth was observed by incubating all sample plates for 48 hours at a temperature of 37oC in a 5-10% solution of carbon dioxide.

Identification of bacteria was done with the help of hand lens and standard biochemical tests. The procedure was repeated if multiple growths were seen. Antimicrobial susceptibility profile was done by Kirby Bauer disc diffusion method on Muller Hinton agar using antibiotic discs of Oxoid (UK) according to CLSI 2010 guidelines.

Susceptibility testing was carried out to routinely used antibiotics including Amoxicillin clavulanic acid, Amikacin (30µg), Ciprofloxacin (5 µg), Levofloxacin (10µg), Nitrofurantoin, Ceftazidime (30µg), Cefotaxime (30µg), Ceftrixone (30ug), Imipenem (10 µg) and Meropenem (10 µg). The details of each patient was recorded in a predesigned proforma.

All data was analyzed using SPSS version 20. Mean and standard deviation (mean +SD) was calculated for quantitative data. Frequencies and percentages were presented for qualitative variables. Association of causative Organism with age groups and gender was assessed by using chi square test. P value $\leq$ 0.05 was considered significant.

Results

The mean age of the patients was 5.42 ± 2.043 years ranged from 2 to 9 years of age and (45.4%) were above 5 years. Among total sample of 370 patients 200 patients (54.1%) were female while remaining 170 patients (45.9%) were male. The most common organisms responsible for Urinary Tract Infection (UTI) found were E Coli (47.6%) followed by Klebsiella (23.2%) and Proteus (10%), Staphylococcus was found in (7.3%) and Enterobacter in (7.3%) children, and rest (4.6%) were effected with other organisms (Table I).

Table 1: Causative Organism distribution of sampled population

Organism	Frequency	Percent
E Coli	176	47.6
Klebsiella	86	23.2
Proteus	37	10
Staphylococcus	27	7.3
Enterobacter	27	7.3
Others	17	4.6
Total	370	100.0

The sensitivity pattern shows that Meropenum 286 (77.3%) and Ceftazidine286 (77.3%) showed highest sensitivity and lowest resistance pattern followed by Levofloxacin 285 (77.0%), Imipenem 284 (76.8%) and Amikacin 279 (75.4%) respectively. The sensitivity pattern of Co-Amoxiclav 252 (68.1%), Ceftriaxone233 (63.0%), Ciprofloxacin 232 (62.7%) and Nitrofurantoin 231 (62.4%) was comparatively low in our setup as described in (Table II).

The results of the analysis showed that there was no statistically significant (p-value = 0.456) association between organism responsible for UTI and gender. In 86 Klebsiella patients 40 were males and 46 were females. Out of 37 Proteus patients 9 were males and rest of 18 were females. Among 27 Enterobacter patients 9 patients were male and remaing 18 were female. 27 Staphylococcus patients were included 11 males and 16 female patients. While in 17 other organismic effected patients 7 were males and 10 were females. (Table III).

Table II: Distribution of antibiotics sensitivity patterns

Antibiotics	Sensitive (%)	Resistant (%)
Meropenem	286 (77.3)	84 (22.7)
Ceftazidine	286 (77.3)	84 (22.7)
Levofloxacin	285 (77.0)	85 (23.0)
Imipenem	284 (76.8)	86 (23.2)
Amikacin	279 (75.4)	91 (24.6)
Co-Amoxiclav	252 (68.1)	118 (31.9)
Ceftriaxone	233 (63.0)	137 (37.0)
Ciprofloxacin	232 (62.7)	138 (37.3)
Nitrofurentoin	231 (62.4)	139 (37.6)

Table III: Association betweenGenders with causative Organism

Organism	Gender		Total	P-Value
	Male	Female		
E Coli	89	87	176	0.456
Klebsiella	40	46	86	
Proteus	14	23	37	
Enterobacter	9	18	27	
Staphylococcus	11	16	27	
Others	7	10	17	
Total	170	200	370	

Similarly, there was no significant (p=0.535) relationship between age and causative organism found in children with UTI. Among 168 patients with above 5 years of age, 89 patients of E Coli, 36 patients of Klebsiella, 16 patients of Proteus 11 patients of Enterobacter, 10 patients of Staphylococcus and 6 with other organisms. While rest of 202 patients were either 5 years of their age or below. (Table IV).

Table IV: Association between causative Organism &Age Groups

Organism	Age Groups		Total	P-Value
	5 Years & below	Above 5 Years		
E Coli	87	89	176	0.535
Klebsiella	50	36	86	
Proteus	21	16	37	
Enterobacter	16	11	27	
Staphylococcus	17	10	27	
Others	11	6	17	
Total	202	168	370	

Discussion

Any part of the urinary tract can be infected during urinary tract infection including kidneys (pyelonephritis), bladder (cystitis) and urethra. Usually UTI in children

occurs due to ascending infection but in the first year of life hematogenous spread may be more common. It is one of the common infections in children but difficult to diagnose because symptoms are nonspecific, more so in young children.[17,18]

The pediatric age group is very sensitive to different types of infections and UTI is considered an important cause of childhood morbidity. Many further investigations are required in children with UTI to make effective treatment plane and save the child from additional impediments. [19]

Previous studies showed females predominance in pediatric age with respect to UTI. However, overall the prevalence was more in female patients than male patients. The results of this present study showed same trend, there were 54.1% female babies while remaining 45.9% were male babies. Females are more prone because their urethra is shorter and closer to the anus. Similar gender wise prevalence was reported by Afsharpaiman S. [20]

Urinary tract infection is common among children. The most common organisms responsible for Urinary Tract Infection (UTI) found were E Coli (47.6%) followed by Klebsiella (23.2%) and Proteus (10%), Staphylococcus was found in (7.3%) and Enterobacter in (7.3%) children, and rest (4.6%) were effected with other organisms. Most of the other studies also reported E Coli as most frequent organism found in pediatric UTI patients.[7,8]

In the study by Ipek et al, out of the 126 urine samples, Escherichia coli was the leading uropathogen (81.7%), followed by Proteus spp (7.1%), Klebsiellaspp (4.0%). Among the isolated uropathogens, resistance to ampicillin amoxicillin-clavulanate, cefazolin and trimethoprim-sulfamethaxazole was remarkable.[14]

There are many ways though which antimicrobial resistance may be developed against microorganisms. This process of resistance development is precipitous enough depending upon the progression of resistant genes transformation by means of R plasmids against E coli and many other bacteria belonging to gram negative family. [23]

The sensitivity pattern of drugs was quite encouraging. The highest sensitivity pattern was shown by Meropenum (77.3%) and Ceftazidine (77.3%) followed by Levofloxacin (77.0%), Imipenem (76.8%) and Amikacin (75.4%) respectively. The sensitivity pattern of Co-Amoxiclav (68.1%), Ceftriaxone (63.0%), Ciprofloxacin 232 (62.7%) and Nitrofurantoin 231 (62.4%) was comparatively low in our setup.

The sensitivity pattern of Ceftazidine (77.3%), Levofloxacin (77.0%), Imipenem (76.8%) and Amikacin (75.4%) was very high in this present study but the previous researches showed very different results. In a study by Yolbas I, et al the sensitivity of Ceftazidime was noted (60.4%), Levofloxacin (52.3%), which is very low in comparison to this study but the sensitivity of Amikacin (89.2%) was very high as compared to our results. [24-26]

Similarly, the results of present study showed that (68.1%) patients were sensitive to Co-amoxiclav, which is very high from other studies that have shown comparatively very low sensitivity to co-amoxiclave with E Coli. Resistance to Co-amoxiclav is wide spread which makes the options difficult. [27, 28]

The sensitivity patterns of other antibiotics were also quite high like (75.4%) samples were sensitive to amikacin. Similarly, high sensitivity (84%) was noted by Afridi JK, [1] and many other studies from Turkey,[29] India,[30] and Germany.[31]

The results of the present study showed that sensitivity of Ciprofloxacin was only (62.7%), which is very low in comparison to previous studies which showed very high sensitivity pattern (94%) in pathogens of UTI. [32] E.coli ,Klebsiella and other urinary tract pathogens have high resistance rate against Co-Amoxiclav, Ceftriaxone, Ciprofloxacin and Nitrofurantoin and have high susceptibility rates to Ceftazidine, Levofloxacin, Imipenem and Amikacin in children.

Conclusion

In our setup E-coli and kliebsiella are most common causative pathogen for UTI and most were sensitive to Meropenem, Ceftazidine, Levofloxacin, Imipenem and Amikacin. Where and when culture and sensitivity is not available or cannot wait for results, UTI can be treated empirically with these antibiotics in our setup however urine culture and sensitivity should be still done where possible.

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