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EVALUATING ANTIBIOTIC RESISTANCE IN URINARY TRACT INFECTION IN CHILDREN YOUNGER THAN 14 YEARS OLD VISITING IMAM-ALI HOSPITAL, 2016

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Abstract:
After respiratory and digestive infection, urinary tract infection is the most common disease in children and it counts for 2% of cases visiting pediatricians. Due to the excessive consumption of antibiotics with different dosages and insufficient time, the resistance and strength of different strains change so constantly that it is necessary to review the process of these changes every 3 to 5 years. The main objective of the present study is evaluating antibiotic resistance in urinary tract infection in children younger than 14 years old visiting Imam Ali Hospital in 2016. The present cross-sectional study reviewed clinical records of patients hospitalized in Imam Ali hospital of Zahedan due to urinary tract infection in 2016. Required data was collected using a researcher-made questionnaire and analyzed through SPSS18 and chi square test; P<0.05 was considered significance level. Out of 100 patients, 68 subjects (68%) were female and 32 cases (32%) were male; 4 main germs causing urinary tract infection were studied, out of which E.coli was the most (65%) and Staphylococcus the least common (42%) causes of infection. The highest resistance rate against infection generating factors turned out to be 89% in girls and 91% in boys in case of ampicillin and 73% for girls and 67% for boys in case of cotrimoxazole; the lowest resistance rate turned out to be 7% in girls and 16% in boys and was related to amikacin. The results of the present study confirm increasing drug resistance in different pathogens. In fact, urine culture and antibiotic susceptibility testing are necessary before the onset of treatment and appropriate antibiotic selection. It is recommended for further studies to investigate antibiotic resistance in urinary tract infections in children around the world.
Key Words: *Antibiotic Resistance, Urinary tract Infection, Children.*

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INTRODUCTION:

The mortality rate of children has decreased from 12.5 million in 1990 to 8.8 million individuals in 2008 [1]. However, infectious diseases are still major causes of death among children. Urinary tract infection, which is the result of the activity of pathogenic bacteria in the urinary tract, one of the most common infections in outpatients and hospitalized subjects [2]. After respiratory and digestive infections, urinary tract infection is the third common form of infection among children and, about, 2% of patients visiting pediatricians and 15% of subjects referring to emergency rooms are diagnosed with this disease. As a common infection among children, urinary tract infection includes 1% of baby boys and 1 to 3% of baby girls. The mean age of diagnosis of urinary tract infection is 5 years old for girls, starting with the inauguration of urinalysis. Being more common among non-circumcised boys, this infection emerges at the first year of their lives among boys. The prevalence of urinary tract infection varies with age, the proportion of boys to girls being 2.8-5.4 to 1 in the first year and 10 in the second year if their lives. Infects, boys will be infected with urinary tract infection at least once until they get 10 years old. Although E.coli is the most common microorganism causing urinary tract infection, other gram-negative strains, also play, a major role in these infections [3]. The Importance of Urinary Tract Infection is due to the possibility of septicemia, the probability of congenital malformations of the urinary tract as a cause of recurrence of infection, renal tissue damage and urinary bladder reflux, which can lead to renal scarring, hypertension, and impaired growth or chronic renal failure, and considerable educational failure in the future life of the individual. Due to high incidence and serious complications, timely diagnosis and treatment with appropriate antibiotics are quite necessary in the improvement of the individual and the prevention of kidney scarring and other complications before the urine culture and anti-biogram are known [4]. An overabundant use of antibiotics is the basis of resistance to available and commonly taken medicines and has led to the administration of recent medications. Drug resistance to antibiotics in different parts of the world is different due to genetic changes in the drug and the difference in the use of antibiotics and the difference in access to broad and new antibiotics. In addition to determining the prevalence of common pathogens, their susceptibility to different antibiotics should be evaluated in order to provide a suitable treatment for each geographical region; Due to the excessive consumption of antibiotics with different dosages and insufficient time, the resistance and strength of different strains change so constantly that it is necessary to review the process of these changes every 3 to 5 years. The main objective of the present study is evaluating antibiotic resistance in urinary tract infection in children younger than 14 years old visiting Imam Ali Hospital in 2016.

MATERIALS AND METHODS:

The present cross-sectional study reviewed clinical records of patients hospitalized in Imam Ali hospital of Zahedan due to urinary tract infection in 2016; patients with positive culture were included in the study. In order to improve the accuracy of the study, samples that were prepared by Suprapubic method were examined. In case of urine samples cultured through Suprapubic method, the existence of any number of organisms is considered to be positive. All demographic data including age, sex, place of residence and information related to prophylaxis antibiotics and subtypes and urinary anomalies were extracted using a researcher-made questionnaire from patient records. All urine samples containing more than one organism accompanied by a lack of urine culture and clinical signs were excluded from the study due to the possibility of contamination; patients with a history of antibiotic use were, also, excluded from the study. Collected data was analyzed through SPSS version 18 and chi square test and $P<0.05$ was considered significance level [5-7].

FINDINGS:

Out of 100 patients, 68 subjects (68%) were female and 32 cases (32%) were male; 4 main germs causing urinary tract infection were studied, out of which E.coli was the most (65%), 45% in boys and 72% in girls, and Staphylococcus the least common (42%) causes of infection. The highest resistance rate against infection generating factors turned out to be 89% in girls and 91% in boys in case of ampicillin and 73% for girls and 67% for boys in case of cotrimoxazole; the lowest resistance rate turned out to be 7% in girls and 16% in boys and was related to amikacin (Table 1); the highest frequency of sex-based resistance turned out to be 89% in girls and 91% in boys (Table 2). Escherichia coli, as the most common cause of infection, showed the highest resistance to ampicillin (92.4%) and the lowest resistance to amikacin (4%)(Table 3).

Table 1: Frequency of urinary tract infection based on sex and type of bacteria.

Pathogen / Sex	E.Coli	Enterobacter	Pseudomonas	Staphylococcus	Other
Girls	41-41%	9-0.9%	05%-5	4-0.4%	3-0.3%
Boys	24-24%	6-0.6%	4-0.4%	3-0.3%	1-0.1%
Total	65-65%	15-15%	9-0.9%	7-0.7%	4-0.4%

Table 2: Frequency of antibiotic-resistant based on the type of antibiotic and sex.

Antibiotics	Girls	Boys
Ampicillin	60 -89%	29-91%
Co-trimoxazole	51- 75%	21-65%
Cefalexin	47 – 69%	20-62%
Nitrofurantoin	16 -23%	15-47%
Nalidixic acid	21 -31%	13-41%
Ceftriaxone	17-25%	11-34%
Gentamicin	15-22%	13-41%
Amikacin	5-07%	7-22%

Table 3: Frequency of urinary tract infection based on organism and antibiotic.

Pathogen / Antibiotics	E.coli	Enterobacter	Pseudomonas	Staphylococcus
Ampicillin	59	18	9	7
Cefalexin	38	16	9	6
Co-trimoxazole	41	12	9	5
Nitrofurantoin	16	7	8	2
Gentamicin	9	5	1	6
Amikacin	5	4	1	2
Nalidixic acid	14	6	8	1
Ceftriaxone	12	6	1	5

DISCUSSION:

After respiratory infection, urinary tract infection is the second most common form of infection around the world and it infects more than 150 million individuals each year [8]. Generally speaking, bacteria use different strategies to stay away from the effects of antibiotics. In fact, due to increased drug resistance in microorganisms, antibiotics, that have been effective at the time, have very little effect on bacteria producing urinary tract infection, resulting mainly from emergence and development of resistant strains of bacteria and un-prescribed use of antibiotics [7, 10]. Given the significance of the issue, the present study was conducted to evaluate antibiotic resistance in urinary tract infection in children younger than 14 years old visiting Imam

Ali Hospital in 2016. Based on the findings of the present study, E. coli turned out to be the most common (65%) cause of infection; this rate varies greatly, ranging from 56.2% to 87%, in different studies conducted in different parts of the world; this rate was 87% in Luetter et al study (2005)[11]. The frequency rate of Escherichia coli to other organisms was significantly higher in girls in comparison to boys. According to Ghedira et al study (2004), which was conducted in Tunisia, ICELAI was reported as the most common cause of infection, with the highest antibiotic resistance to ampicillin (88%) and of cotrimoxazole (63%), in girls [12]. Based on various studies, although highest resistance, 48% in USA, 55% in Brazil, an 49% in Turkey, was reported to be against this antibiotic (ampicillin), its frequency was much less than that of the present study [13, 14]. After ampicillin, the highest resistance occurred in case of cotrimoxazole, 51% in both Brazil and UAE, which is consistent with the results of the present study. After ampicillin, the highest resistance turned out to be related to cefalexin (25%) in USA. The lowest resistance rates were related to nitrofurantoin and amikacin in the present study; resistance to amikacin turned to be 2% in Brazil and less than 1% in USA, which is consistent with the findings of the present study [15]. According to study of Kurutepeet et al 2005, Nitrofurantoin turned out to be the most sensitive antibiotic (808%), which is, again, consistent with the findings of the present study [16]. Although gentamicin and cefotaxime turned out to have the lowest resistance after amikacin in the USA, the resistance rate of these two antibiotics were reported higher in the present study. The resistance to three antibiotics was 56% in the present study and 24% in Turkey. Generally, the antibiotic resistance rate is high in Iran in comparison to some other countries; this difference might be due to microorganisms, arbitrary use of drugs by patients, failure to complete the course of treatment, improper administration of antibiotics by physicians, inadequate drug administration, drug quality based on the manufacturer, committed to empirical treatment, regardless of the outcome of the cultures and the antibiotic. Comparison of antibiotic resistance in the present study showed that there was a significant increase in resistance to ceftriaxone and nalidixic acid and the level of resistance to nitrofurantoin has decreased (P<0.05). 68% of participant subjects in the present study were girl, which is, also, consistent with several other studies in this regard.

CONCLUSION:

In this study, the prevalence of non-E.coli pathogens in children and children receiving prophylactic drugs was significantly higher than other children; however, no significant relationship was found between age, history of infection and anomaly. The results of the present study indicate an increase in drug resistance in different pathogens. Also, due to the increased antibiotic resistance of urinary tract infections, urine culture and antibiotic susceptibility testing are necessary before the onset of treatment and appropriate antibiotic selection. It is suggested that antibiotic resistance in patients with urinary tract infection in the rest of the world be investigated in the future.

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