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URINARY TRACT INFECTION IN CHILDREN UNDER 12 YEARS OLD IN GAZA CITY PEDIATRIC HOSPITALS

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ABSTRACT

One hundred and forty six cases (out of 439 urine samples) were identified as confirmed positive UTI cases. The prevalence rate of UTI was 33 %. Females were harbored UTI infection more frequently than males, 81.5 %, and 18.5 %, respectively. The highest infected groups were 13-36 months (35 %), and 37-72 months (33 %). The samples confirmed as positive were 82.7 % of the mid stream, 65.8 % of sterile bag, and 100 % of samples collected by catheters. The frequency of isolated uropathogens were *E. coli* 71.9 %, *Klebsiella pneumonia* 9.6 %, *Proteus mirabilis* 7.5 %, *Pseudomonas aeruginosa* 5.5 %, *Staphylococcus sp* 1.4 %, *Acinatobacter sp* 0.7 %, *Enterococcus sp* 0.7 %, *Enterobacter sp* 0.7 %, and *Candida sp* 2.1 %. The most effective antibiotic were imipenem 95.8 %, Amikcin 91.0 %, Ciprofloxacin 86.7 %, Ceftazidime 84 %, Cefotaxime 81.1 %, Ceftriaxone 80.4 %, Gentamycin 79.7 %, Cefuraxime 74.1 %, Nalidixic acid 67.1 %, and Nitrofurantoin 65.0. The study emphasize a significance proportion of children suffering from UTI and therefore a appropriate strategies should be implemented to increase awareness of UTI and its complications particularly in children

Key words: ***Urinary tract infection; Antibiotic susceptibil Uropathogen ity;; Vesicoureteral reflux***

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INTRODUCTION

Urinary tract infection (UTI) is an important cause for fever in young children. It represents the commonest genitourinary disease and are the second commonest disease which affect them [1]. Infection may occur at many places along the genitourinary, urethra, bladder, ureter, renal pelvis or renal parenchyma [1,2]. The prevalence of urinary tract infection varies markedly with sex and age. Symptomatic urinary tract infections occur in about 1.4 per 1000 newborn infants, with slight male preponderance [2]. It is assumed that the short urethra in girls predisposes them to ascending infection, because *E. coli* serotypes (for example) from bowel flora are the same as those that infect the urinary tract. However, factors other than the proximity of gut flora to the short urethra are likely, because the female to male ratio in urinary tract infection varies directly with age [1]. Up to 7 percent of girls and 2 percent of boys will have a symptomatic, culture confirmed UTI by six years of age [3]. Young otherwise healthy women are commonly affected with an estimated incidence of 0.5-0.7 infections per year, 25-30 % of the women affected will go on to develop recurrent infections not related to any functional or anatomical urinary tract abnormality [4].

Microbiologically, urinary tract infection exists when pathogenic microorganisms are detected in the urinary tract [3]. The infection is considered significant and requires treatment when more than 10^5 microbial cells per milliliter of urine are present in a properly collected specimen [3]. Gram negative bacteria such as *E. coli*, *Proteus sp*, *Klebsiella sp*, *Enterobacter sp*, *Serratia sp,* and *Pseudomonas sp* are usually detected in recurrent infections, especially in association with stones, obstruction, urologic manipulation and nosocomial catheter associated infections. Most UTI in children result from ascending infection although hematogenous spread may be more common in the first 12 weeks of life. Most UTI in children are mono-microbic often caused by *E. coli* 60 to 80 percent of cases, *Proteus* (more common in boys and in children with renal stones), *Klebsiella*, *Enterococcus* and *Coagulase negative Staphylococci* [5]. Evidence on risk factors for UTI in children is limited in which associated with constipation encompresis bladder instability, and infrequent voiding in such studies [6] but not in cases of febrile children younger than two years, bathing and back to front wiping have not been demonstrated to be risk factors [7]. The role of the vesico-ureteric valve in the maintenance of unidirectional urine flow, the cause of vesico-ureteric reflux (VUR) is a developmental anomaly resulting in an inadequate length of the intravesical submucosal ureter [8]. A substantial number of children also have dysfunctional voiding, which may initiate or perpetuate VUR [9]. Studies have shown a higher UTI prevalence of 8.35 % in malnourished children, with the risk of bacteremia increasing significantly with the malnutrition [10]. Older children with UTI may have dysuria frequency, urgency, hesitancy, small volume voids, or lower abdominal pain, infants with UTI more commonly present with non specific symptoms, such as fever irritability, jaundice, vomiting or failure to thrive. Unusual odor of the urine not helpful in predicting UTI [11]. Urine culture is required for diagnosing of UTI, the diagnostic threshold depends on the method of urine collection. Compilation of studies comparing counts of colony forming units (CFU) from various collection methods with the probability of UTI has been detected. For urine collection from infants and young children suprapubic aspiration or transurethral catheterization generally is recommended. Urethral catheterization is more likely than aspiration to obtain a sufficient sample of urine [12]. Collection from boys leads to high contamination rates [13]. Clean catch urine

collection from infants requires more patience and effort than the use of pads or bags, but this method is reasonably accurate and rates of contamination are low [14]. The early diagnosis and prompt treatment of urinary tract infection, especially in infants and young children are of crucial importance. One must be aware of the nonspecific manifestations of UTI early in life when most of the kidney damage due to infection occurs. The diagnosis in questionable cases especially in infants should be verified by suprapubic aspiration or sterile bladder catheterization. Children with vesicoureteral reflux or with recurrent UTI should be checked for the presence of infection and be followed closely to prevent the development of renal parenchymal scars [15

MATERIALS AND METHODS

Study Population

The present study was carried out in the Gaza city pediatric hospitals (Al nasser and Al dorra). The period of the study continued for 12 months, from January 2007 to December 2007. The samples were collected from 439 patients in the emergency departments (out patients), and other departments in the hospitals (in patients), clinically suspected to have urinary tract infections according to symptoms and complains like abdominal pain, dysuria, urgency, frequency, hematuria, and absence of another source of fever. The age of the patients ranged from one day to twelve years. The patients were divided into four age groups including; 0-12 months, 13-36 months, 37-72 months, and 73-144 months. The parents of the subjects (children) were informed on the aim and the nature of the study and gave consent.

Specimen collection

Four methods of urine collection were used in the present study: a) Midstream collection technique b) Bag collection technique c) Catheter collection technique and d) Supra-pubic collection technique. The urine samples were transported immediately to microbiology department for culture and routine department for analysis, if there was delay in process, it was stored at refrigerator at 4 – 6 °C, this inhibit the growth of bacteria and also preserve the white blood cells, until processed within 2 hours **[16]**. Questionnaire was filled for each selected cases, the questions were in multiple choice format and covered the following subjects: 1) Gender of the child, 2) Age of the child, 3) Method of urine collection, 4) The symptoms or complains, 5) Hemoglobin % of child, 6) WBCs count of blood, 7) Blood urea level, 8) C reactive protein, 9) Urine culture result, and 10) Urine analysis result.

Laboratory evaluation

Urine culture was performed quantitatively, and uropathogens were identified according to routine laboratory methods. In brief Culture of each un-centrifuged urine specimen was done quantitavely on 5 % blood agar, MacConky, and Sabouraud agar plate (2 samples inoculated on 9cm plate) using a sterile calibrated loop of standard dimension to take approximately fixed and known volume (0.001ml), so one colony on the plate represents 1000 cells of organisms per ml, the plates were incubated aerobically at 37 C for 24 – 48 h., and the number of colonies was counted, mixed growth cultures are interpreted as negative culture, only growth of single uropathogen of colonies count ≥ 105 CFU/ml is interpreted positive culture .

Pathogen identification

Uropathogens were identified by standard laboratory methods. In brief, bacterial species were identified by performing Gram staining and microscopic examination for. A number of available commercial biochemical tests were used in addition to supplementary specific test, including API 20E for G-negative enterobacteriaceae. For Gram-positive cocci, a catalase test was performed. In order to distinguish S. aureus from coagulase-negative

Staphylococcus (*CoNS*), catalase-positive cocci were selected and tested for mannitol fermentation and coagulation activity. The selected organism was considered *S. aureus* if the results were positive and it was considered *CoNS* if the results were negative.

Sensitivity test

Bacterial susceptibility testing of isolated pathogens was determined by disc agar diffusion method, according to the Kirby-Bauer method, as described by National Committee for Clinical Laboratory Standards **[17]**. Antibiotic sensitivity testing is an in vitro method for estimating the activity of antimicrobial drugs (antibiotics) against an infecting microorganism in vivo. The Kirby-Bauer method is based on the observation that the degree of inhibition of bacterial growth on agar medium surrounding an antimicrobial-containing disc correlates with susceptibility to the agent. These were the following antibiotics: Ampicillin, Amoxycillin, Cephalexin, Cefuroxime, Cefotaxime, Ceftazidim, Ceftriaxone, Imipenem, Amikacin, Gentamicin, Nitrofurantion, Trimethoprime/sulfamethoxazole, Nalidixic acid, and Ciprofloxacin.

RESULTS

Table (1) illustrated 146 eligible confirmed UTI cases were distributed in the gender category as 27(18.5 %) males and 119(81.5 %) females. At the same time the distribution in the order of age was 5 (3.4 %) males and 7(4.8 %) females for the age group 0-12 month, 20(13.7 %) males and 31(21.2 %) females for age group 13-36 months, 2(1.4 %) males and 46(31.5 %) females for age group 37-72 months, and only 35 (24 %) females for age group 73-144 months. It also showed that the most common urinary infections were of age group 13-36 months (35 %), followed by age group 37-72 months (33 %), (24 %) of age group 73-144 months, and the least common urinary infections were of age group 0-12 months (8.2 %).

Table (1)

Distribution of confirmed urinary tract infection cases by age group and gender.

Gender / Age group (month)	Confirmed UTI cases					
	Male		Female		Total	
	Freq	%	Freq	%	Freq	%
0 -12	5	3.4	7	4.8	12	8.2
13-36	20	13.7	31	21.2	51	35
37-72	2	1.4	46	31.5	48	33
73-144	0	0	35	24	35	24
Total	27	18.5	119	81.5	146	100

Table (2) illustrated the symptoms accompanied UTI cases in relation to age group. The most frequent symptom was abdominal pain 92 (63 %) followed by dysuria 86(58.9 %), pyrexia 38(26 %), vomiting 12(8.2 %), diarrhea 4(2.7 %), failure to thrive 3 (2.1 %) and 14 (9.6 %) cases were diagnosed clinically after performing ultrasound and VCUG to have VUR disease.

Table (2)
Clinical symptoms of confirmed positive UTI cases.

Age group (month) / Symptom	0-12		13-36		37-72		73-144		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Pyrexia	8	66.7	18	35.3	9	18.8	3	8.6	38	26
Abdominal pain	2	16.7	42	82.4	27	56.3	21	60	92	63
Vomiting	3	25	6	11.8	4	8.3	1	2.9	12	8.2
Dysuria	0	0	29	56.9	38	79.2	19	54.2	86	58.9
Failure to thrive	3	25	0	0	0	0	0	0	3	2.1
Diarrhea	3	25	1	2	0	0	0	0	4	2.7
VUR	0	0	3	5.9	7	10.4	4	11.4	14	9.6

Table (3) illustrated the frequency of isolated uropathogens from confirmed UTI cases, the most frequent isolated uropathogen was *E. coli* 105(71.9 %), and non *E. coli* uropathogens were account for (28.1 %) and include the following: *Klebsiella pnuemonia* 14(9.6 %), *Proteus mirabilis* 11(7.5 %), *Pseudomonas aeruginosa* 8(5.5 %), *Staphylococcus sp* 2(1.4 %), *Enterococcus sp* 1(0.7 %), *Enterobacter sp* 1(0.7 %), *Acinetobacter sp* 1(0.7 %), and *Candida sp* 3(2.1 %).

Table (3)
Frequency of isolated uropathogens.

No.	Uropathogen	Frequency	Percentage
1	***E. coli***	105	71.9
2	***Klebsiella pneumonia***	14	9.6
3	***Proteus mirabilis***	11	7.5
4	***Pseudomonas aeruginosa***	8	5.5
5	***Staphylococcus sp***	2	1.4
6	***Enterococcus sp***	1	0.7
7	***Enterobacter sp***	1	0.7
8	***Acinetobacter sp***	1	0.7
9	***Candida sp***	3	2.1

Table (4) illustrated the susceptibility patterns of different antibiotics use in the treatment of UTI. The results demonstrated that the antibiotics had the highest susceptibility were imipenem 137 (95.8 %) followed by amikacin 130 (91 %), ciprofloxacin 124 (86.7 %), cetazidime 120 (84 %), cefotaxime 116 (81.1 %), ceftriaxone 115 (80.4 %),gentamycin 114 (79.7 %), cefuraxime 106 (74.1 %), nalidixic acid 96 (67.1 %), nitrofurantoin 93 (65 %), cephalexin 40 (28 %), trimethoprim-sufamethoxazol 34 (23.8 %), amoxicillin 28(19.6 %), and the lowest susceptibility was ampicillin 7 (4.9 %).

Table (4)
Antibiotic susceptibility tests of urinary tract infection uropathogens.

Antibiotic	Frequency of susceptibility	percentage of susceptibility	percentage of resistance
Ampicillin	7	4.9	95.1
Amoxycillin	28	19.6	81.4
Cephalexin	40	28	72
Cefuraxime	106	74.1	25.9
Cefotaxime	116	81.1	18.9
Ceftazidime	120	84	16
Ceftriaxone	115	80.4	19.6
Imipenem	137	95.8	4.2
Ciprofloxacin	124	86.7	13.3
Nalidixic acid	96	67.1	32.9
Nitrofurantoin	93	65	35
Amikacin	130	91	9
Gentamycin	114	79.7	20.3
Trimethoprim-sulfamethoxazol	34	23.8	76.2

Table (5) illustrated some risk factors associated with development of UTI in children (female gender, presence of vesicouretral reflux (VUR), low hemoglobin level and presence of crystals in urine). Cross tabulations and chi square tests were performed to detect statistically significant difference among these variables. Results showed that vesicoureteral reflux (VUR) was the most common risk factor associated with development of UTI in children (*P*-value = < 0.001), with odds ratio (O.R.) = 7.66, it also showed that female gender had a statistical significant as a risk factor for UTI in children in which the urinary infections were more commonly in females 81.5 % than males 18.5 % with *P*-value = < 0.001 and odds ratio (O.R.) = 3.01. Meanwhile results of the present study showed that UTI development in children had no statistical significant correlation with low hemoglobin level (*P*-value = 0.164), (O.R.) = 1.44, and presence of crystals in urine (*P*-value = 0.116), odds ratio (O.R.) = 1.70.

Table (5)
Risk factors associated with UTI in children.

Status Variable		UTI				*P*- value	Odds ratio
		Positive		Negative			
		N	%	N	%		
Gender	**M**	27	18.5	119	81.5		
	F	119	40.6	174	59.4	< 0.001	3.01
VUR	**Present**	14	77.8	4	22.2	< 0.001	7.66
	absent	132	31.4	289	68.6		
Hb	**<11g/dl**	121	34.9	226	65.1	0.164	1.44
	>11g/dl	25	27.2	67	72.8		
Crystals in urine	**Present**	17	11.6	21	7.2	0.116	1.70
	absent	129	88.4	272	92.8		

(P-value significant < 0.05)

DISCUSSION

Acute urinary tract infection represents an important health problem for the developing countries and Gaza strip especially, since it causes a high morbidity and serious complications like pyelonephritis which can result in renal scars that increase the risk of hypertension and renal failure. These multiple factors might play an important role in the prevalence of UTI among the children in Gaza. This study was conducted to find out the prevalence of UTI. In addition to determine the most frequent uropathogens, and the appropriate antibiotic that could be used in the treatment of these infections. The children participated in present study aged from 1 day to 12 years, the criteria used in their selection was based on the symptoms or complains accompanied UTI like abdominal pain, vomiting, dysuria, children with diarrhea, and failure to thrive infants (physician clinical examination). The eligible number of children enrolled in the study was 439 on which analysis was performed. Confirmed positive UTI cases were diagnosed according to mentioned clinical symptoms, positive urine culture (colony count of single uropathogen $\geq 10^5$ CFU/ml), and pyuria (urine leukocyte ≥ 5/HPF) on microscopic urine analysis. 146 cases were proved to harbor one uropathogen with prevalence rate 33 %, and showed that urinary tract infection were more commonly in females 119(81.5 %) than males 27(18.5 %), which was statistically significant with P-value = < 0.001 (P- < 0.05 was considered significant). In the first year of age no difference in the infection rate between male and female 3.4 % and 4.8 % respectively, while at age of 37–72 months, the difference is high, 1.4 % male, and 31.5 % female, and at age of 73–144 months all patients were females, therefore female predominance has been observed after three years of age. This findings was in agreement with other studies conducted [18]. Majority of the patients 76 % belonged to age 12-72 months, which coincides with studies from different parts of the world [19]. This could be attributed that this age group of 12-72 months is more susceptible to infection due to their toilet training problems. The number of the UTI cases was the least in the neonatal period which may due to unchange in the periuretheral flora (the periuretheral flora with few pathogenic strains in this period), and the cases increased with increasing the age of children until 6 years which may due to their toilet training problems [20], and declined after the 7 years till 12 years, this could be attributed to the school children group period which are in compliance of their parents instructions and well trained especially in using toilet.

Most frequent symptoms accompanied UTI cases were abdominal pain (63 %), dysuria (58.9 %), fever (26 %), vomiting (8.2 %), diarrhea (2.7 %), and failure to thrive (2.1 %). These multiple symptoms are not present only in UTI and could be associated with other disease, therefore abdominal pain and dysuria may be considered as a good indicator of UTI. The association between vesicoureteric reflux (VUR) and renal damage was found, the term reflux nephropathy (RN) was first used to describe the renal damage caused by VUR, there is a predisposition of those with VUR to develop UTI. The cause of VUR is a developmental anomaly resulting in an inadequate length of the intravesical submucosal ureter [8]. A substantial number of children also have dysfunctional voiding which may initiate or perpetuate VUR (Koff, 1992). The association of VUR with nephropathy is paradoxical while most children with renal lesions don't have VUR, numerous studies show a close relation between VUR and nephropathy [21]. In the present study the number of patients with VUR were 14 cases (9.6 % of confirmed positive UTI cases), and the number of patients diagnosed as pyelonephritis were 12 (8.2 % of the confirmed

positive UTI cases), the VUR and pyelonephritis cases were diagnosed by physicians, ultrasound imaging, and voiding cystourethrography (VCUG) were performed, in addition to laboratory diagnosis which include positive urine culture, pyuria, and presence of proteinuria [22]. The gold standard for diagnosis of UTI is the growth of pathogenic bacteria in the urine culture [23]. However diagnosis might be complicated by contamination from fecal bacteria that colonize the perineal area and distal urethra. The diagnostic number of bacteria was 100.000/ ml. E. coli is by far the most commonly isolated organism being responsible for 71.9 % of UTI cases. The other organisms (non *E. coli*) responsible for 28.1 % , includies Klebsiella *pneumonia* 9.6%, *Proteus mirabilis* 7.5 %, *Pseudomonas aerugenosa* 5.5 %, *Staphlococcus sp* 1.4 %, *Acinetobacter sp* 0.7 %, *Enterobacter sp* 0.7 %, *Enterococcus sp* 0.7 %, and the *Candida sp* 2.1 %. The severity of the UTI is related to host susceptibility and bacterial virulence. Uropathogenic *E. coli* belong to specific capsular and flagellar strains and have multiple virulence factors, such as alpha hemolysin, P fimbriae, aerobactines, sat proteins, and necrotizing factors, which enable them to colonize and invade the normally sterile urinary tract and blood stream [24]. By contrast, except for endotoxins, no constant virulence factors were found in *Klebsiella* or *Enterobacter* [25]. Therefore, we assume that the higher rate of *E. coli* in the patients with a normal urinary tract in our study is associated with the higher virulence of *E. coli* compared with non *E. coli* strains, and that the abnormal urinary tract may have made it possible for the less virulent non E. coli bacteria to cause infection. Several studies recognized the same results achieved in the present study. Al Momani, (2006) [18] in his study to UTI. among children in Jordan found that E. coli accounted for the vast majority of infection 72 %, while *Klebsiella pneumonia*, was isolated in 14 %, *Proteus* sp 9 %, *Staphylococcus sp* 4 %, and *Pseudomonas sp* 4 %. Semeniuk and Church, (1999) [26] conducted a study in Canada and found that the most UTI infections were due to *E. coli* or members of the other genera in the Enterobacteriace family 74(82.2 %), and a smaller number were due to *Staphylococcus saprophyticus* as gram positive organism 16 (17.8 %), *Group B Streptococcus* were the only potential uropathogen isolated in nine patients. Akram et al., (2007) [27] isolated E. coli from community acquired UTI 61 % of all clinically significant urinary isolates and 63 % of all *Enterobacteriace*. The present study shows a slight but generalized decrease in bacterial susceptibility of urinary pathogens to common oral antibiotics in children acquired UTI, because young patients with a first episode of UTI are referred for in hospital treatments, and our group is probably representative of the general population in Gaza city. The most common oral antibiotics prescribed in Gaza for UTI are first generation cephalosporines, amoxicillin, ampicillin, and trimethoprim-sulfamethoxazole. Aminoglycosides are the most common parenteral treatment. For secondary prophylaxis, first generation cephalosporine, cephalexin, trimethoprim-sulfamethoxazol and nalidixic acid are commonly prescribed. In our study, almost all the bacteria tested showed a tendency to increased resistance to common used antibiotics. Low susceptibility patterns have been shown for ampicillin (4.9 %), amoxicillin (19.6 %), cephalexin (28 %), the choice of antibiotic should be affected by resistance patterns and other consideration. Amoxicillin was traditionally the first therapy for out patient treatment of UTI in children; However increased rates of *E. coli* resistance have made amoxicillin a less acceptable choice, also trimethoprim-sulfamethoxazole and cephalexin. Other choice include cephalosporine like cefuraxime, cefotaxime and ceftazidime which showed a high susceptibility patterns (74 %), (81 %) and (84%) respectively, third generation cephalosporin, ceftriaxone (80.4 %) which has the advantage that is used parenterally and for in patient. Fluroquinolones are widely used in

adult patients, although concerns about potential effects on musculo skeletal joints development based on animal data have restricted their use in young children. A recent review of the use of fluoroquinolone for pediatric UTI noted a high rate of efficacy among patient with complex medical conditions or multi drug resistance. Although data on the safety of these agents are limited [28], other oral antimicrobial agents maintained their efficacy against urinary pathogens, nitrofurantoin and nalidixic acid its antibiotic susceptibility (65 %) and (69 %) respectively, these drugs remain a good option for prophylactic treatment, and should not be used to treat UTI in febrile infants because they excreted in the urine and do not achieve therapeutic concentrations in the blood stream [29]. In the present study, overall imipenem susceptibility was (95.8 %), organisms such as *Pseudomonas* showed resistance to imipenem (37.5 %), whereas, other isolates of uropathogens were found to be sensitive to imipenem, it is highly stable against B-lactamase and has an a mucosal property of causing a post antibiotic effect on gram negative bacteria [30]. Due to its small molecular size, it can overcome the poor permeability of B-lactams for Pseudomonas by efficient penetration through the porin.ompD [31]. Higher rates of susceptibility to many antibiotics have been reported in the general population with UTI worldwide. However in the reports that were laboratory focused the overall resistance of uropathogens was lower than our study. This disparity may be attributed to differences in the study samples (Pediatric mixed population). In addition laboratory study may include specimens from a symptomatic patients or patients with external contamination, whereas our study limited to properly collected urine samples in symptomatic pediatric patients [32]. The massive use of antibiotics in the pediatric population is probably a risk factor for increased resistance of uropathogens in our study. Moreover we considered only the fully susceptible specimens as sensitive, all intermediate ones were classified as resistant, leading to lower susceptibility rates.

The main differences between our results and the results of studies conducted in developed countries were the resistance patterns of Enterobacteriace. In our study a higher proportion of strains were resistant to penicillin group (88.2%), and trimethoprim-sulfamethoxazole (76%) than in studies conducted in developed countries (between 30 and 45 % were resistant to amoxicillin and between 20 % and 40 % were resistant to trimethoprim-sulfamethoxazole [33]. Mean which this findings is similar to that observed in the African countries such as Sudan or the Central African Republic [34]. These antibiotics are the most commonly used ones in Gaza strip and developing countries because they are cheap and easy to administer. However resistance to trimethoprim-sulfamethoxazole is lower than in Central African Republic, it is may be due to the fact that this drug is used in the prevention of opportunistic infections associated with HIV and that the prevalence of HIV in Central African is much higher than that reported in Gaza strip. Ginsburg, and McCraken, (1982) [28] reported that the extensive use of these drugs explains the high selection pressure for resistant bacteria. Conversely, strains are rarely resistant to more expensive drugs, our study has shown a high rate of resistant to third generation cephalosporines in subpopulation of children admitted to the hospital for UTI. Some reports showed that the patients receiving prophylactic antibiotics had a high rate of resistance to third generation cephalosporins, despite the fact that the patients were not receiving third generation cephalosporins prophylaxis. In fact none of the patients were receiving any cephalosporins for prophylaxis. There are number of potential explanation for this observation. It is possible that prophylactic antibiotics of any type alter the patients bacterial flora, leading to selection of bacteria

that have resistance to multiple antibiotics, as has been shown for trimethoprim [35].

Univariate statistical analysis of the risk factors associated with development of UTI in children was performed. Results showed that vesicoureteric reflux (VUR) was the most common risk factor associated with UTI (P- < 0.001), and odds ratio (O.R.) = 7.66, this result was in agreement with conducted studies of UTI in children [36]. Panaretto, (1999) [37] reported that vesicoureteric reflux (VUR) was present in 14/34 (34 %) of the group with recurrent UTI with (O.R.) = 3.5. Our results also showed that female gender had a statistical significant as a risk factor of UTI in children in which the urinary infections were more commonly in females 81.5 % than males 18.5 % with P- < 0.001 and odds ratio (O.R.) = 3.01. Sureshkumar et al,. (2008) [38] reported in their study of 2856 children to identify risk factors of UTI in children that female gender is a risk factor with (O.R.) = 2.4. Meanwhile results of the present study showed that low hemoglobin level of the child (< 11.0 g/dl) had no statistical significant correlation with UTI (P-0.101), odds ratio (O.R.) = 1.44.

CONCLUSION

In conclusion the study emphasizes a significant proportion of children suffering from UTI and therefore an appropriate strategy should be implemented to increase awareness of UTI and its complications particularly in children, and to take the appropriate actions to treat such children in an effective way.

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