



Study of Urinary Tract Infection among Children with Vesicoureteral Reflux in Pediatric Central Teaching Hospital in Baghdad

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ABSTRACT

Background: Vesicoureteral disorder increases the risk of urinary tract infections among children, and antimicrobial resistance poses a major threat to patient's treatment.

Method: A descriptive study was applied through which 78 child under 12 years age who had urinary tract infection with Vesicoureteral reflux were admitted to Pediatric central hospital in Baghdad from March 2014 to April 2016.

Results: Male account 45% while female 55% both were equal in causative agent by *Pseudomonas aeruginosa*, *Enterobacter*. and *Acinetobacter spp.*, and most of cases due to *E coli* infection were among age group (less than 1 year). Infection by *Enterobacter spp.* was more among age group (6-12 year), age group (1-5 year) was due to *Proteus* and *Acinetobacter spp.* infection. Antibiotic sensitivity to these bacteria shown variety percent of positive reaction. All types of bacteria shown 100% resistant to certain antibiotic like (augmentin, Ceftriaxone).

Conclusion: In current study Antibiotic resistance is higher, and *E. coli* had a higher prevalence than other.

KEYWORDS : vesicoureteral reflux, UTI

INTRODUCTION

Urinary tract infection is a very common condition in pediatric patients, affecting up to 2% of children in their first year of life. On an average 30-40% of children with their first UTI episode have associated Vesicoureteral reflux (VUR) [1].

VUR is the abnormal flow of urine from the bladder back up the tubes that connect kidneys to bladder. Normally, urine flows only down from kidneys to bladder, VUR is diagnosed in infants and children this disorder increases the risk of urinary tract infections which if left untreated can lead to kidney damage [2].

VUR can be primary or secondary. Children with primary VUR are born with a defect in the valve that normally prevents urine from flowing backward from the bladder into the ureters. Secondary VUR is due to a urinary tract malfunction, often caused by infection [3, 4].

Presently, antimicrobial resistance poses a major threat to patient's treatment as it leads to increased morbidity and mortality, increased hospital stay, and severe economic loss to the patient and nation. The clinical isolates such as *Pseudomonas aeruginosa*, and members of family Enterobacteriaceae, for example, *Klebsiella pneumoniae*, *E. coli*, and *Proteus spp.* rapidly develop antibiotic resistance and spread in the hospital environment [5].

Aims of Study: Identification and determination the bacteria that cause urinary tract infection and their sensitivity to different antibiotics in children patients admitted to hospital due to VUR.

Materials and methods

Ethical consideration: Agreement of parents of patients was obtained and from the manager of the pediatric central teaching hospital in Baghdad city.

Study design:

Descriptive study of Case series type was applied through which 78 child under 12 years age who had at least one symptomatic urinary tract infection and with all grades of VUR were enrolled in this study from March 2014- April 2016. Data regarding age, gender, type of bacteria that cause UTI and result of urine culture was collected by special designed form.

Exclusion criteria: all patients who were parents refused to participate in current study, cases with more than one type of

bacteria as causative agents and patient's loss to follow up.

VUR is usually diagnosed when a urinary tract infection (UTI) is suspected by the following tests:

Ultrasound

1. of the kidneys. This test uses sound waves to find out the size and shape of the kidneys. It can't detect reflux.
2. A urine culture, to check for a UTI

The "gold standard" for diagnosing UTI is the urine culture obtained by suprapubic aspiration, urethral catheterization, a "clean catch" midstream specimen, or urine bag collection [3].

Each urine specimen was first examined microscopically, and then it was cultured. In the first evaluation, 10 ml of urine sample was centrifuged at 3000 rpm for 10 minutes, and the deposit was examined by high power objective lens (40 xs). At least ten high power fields were examined for the presence of leukocytes. Such evaluation was considered preliminary, because the judgment of UTI positivity was based on culture findings.

The number of microorganisms per milliliter recovered from urine culture can aid in the differential diagnosis of urinary tract infection. A loopful of urine (0.01 ml) was spread uniformly on Positive cultures were further identified for members of the family Enterobacteriaceae by methods that included morphological identification (MacConkey agar and Eosin Methylene Blue) and biochemical tests (oxidase, indole formation, methyl red, Voges-Proskauer, catalase, citrate utilization, urease, gelatinase and motility tests), as well as confirmatory API 20E test. The most widely used method for susceptibility test is the disc agar diffusion method which was accepted by the national committee for clinical laboratory standard (NCCLS) [6].

Results:

The study population was consist of male which account about 35(44.9%) while female =43(55.1%) both were equal in causative agent by *Pseudomonas aeruginosa*, *Enterobacter spp.* and *Acinetobacter spp.* While they were varies due to other organism such as in cases due to *E. coli* it was found that 44.8% among male and 55.2% among female but in cases due to *Proteus spp.* and *Klebsiella spp.* It was found that 57.1%, 42.9% among female and male respectively but in cases due to *Citrobacter spp.* about

66.7%among female while 33.3&among male .It was no significant relation between gender and types of bacteria that cause urinary tract infection in cases of VUR in current study by applying statistical test Chi-square test ($\chi^2=0.338$, $df =6$, $p>0.05$) as in table (1).

Age of patients was divided into 3 groups and it was found that most of cases due to *E. coli* infection were among age group (less than one year) *Proteus* and *Acinetobacter* spp. Infection by *Entrobacter* spp.was more among age group (6-12 year)while it was more among age group(1-5 year) in *Proteus* spp.and *Acinetobacter* spp.infection and ,it was no significant relation between age of patients and types of bacteria that cause urinary tract infection in cases of VUR in current study by applying Chi-square test ($\chi^2=1.973$ $df.12$, $p>0.05$) as shown in table (2).

All patients were subjected to urine culture and sensitivity, 38 cases of UTI were caused by *E. coli* and 14 cases was due to *Proteus* spp. and other cases by different bacteria, antibiotic sensitivity were demonstrated to these bacteria with variety of percent of positive reaction to antibiotics as shown in table(3a)and table (3b).

Table (4) Explain the resistant of bacteria that caused UTI among study population to different types o of antibiotic, all types of bacteria that isolated from urine sample of all patients shown 100% resistant to certain antibiotic like (augmentin, Cef tazidim, Ceftriaxone).

Discussion

This study determine the prevalence of UTI in children with VUR equal based on age and gender, this results in agreement with Chand et al [7],the prevalence of bacteria is *E.coli* followed by *Proteus* spp., *Pseudomonas aeruginosa*, *Klebsiella* spp. ,*Citrobacter*, *Enterobacter* spp. and *Acinetobacter*(non *E.coli* group) respectively this results inagreement with Svante Swerkersson et .al[8] . *E. coli* were high in age less than 1 year, this higher rate inagreement with an earlier study showing that UTI caused by *Klebsiella* spp. or *Enterococcus* spp. these due to host susceptibility and bacterial virulence [9]. *E. coli* have specific capsular and flagellar strains and have multiple virulence factors, such as alpha haemolysins, P fimbriae, aerobactins, Sat proteins, and necrotising factors, which make the bacteria colonies and invade the urinary tract and bloodstream by contrast, except for endotoxins, no constant virulence factors were found in non *E.coli* group[10]. The incidence of infection are more in female rather than male because female are more susceptible to UTIs than male, and their infections tend to recur because the urethra is shorter in female than in male this result was agree with Manisha Sahay [11] . *E. coli* detected in age less than 1 year urinary specimens, and are believed to cause hospital-acquired infection due to their resistance to many drugs and also had been previously hospitalized for another disease other then UTI with VUR like sepsis and meningitis or after antibiotic treatment, indicating that previous antibiotic use may have been a risk factor in these cases or may post hospitalization antibiotic prophylaxis [12]. In this study all isolates are complete resistance to the augmentin, ceftriaxone, ceftazidime,pipracillin. *E.coli* isolates sensitive to amikacin, Imipenem, 50% to nitrofurantoin and resistance to other antibiotics, Gottesman and colleagues conducted a retrospective study and assessed the proportion of quinolone-susceptible *E. coli* surrounding a nationwide ciprofloxacin restriction Gottesman et al. 2009 they demonstrated a significant decrease in *E. coli* nonsusceptibility to quinolones from 12% to 9%; notably, this was reversed immediately when quinolone consumption rose. [13].

Proteus spp. and *Pseudomonas aeruginosa* sensitive to the Gentamycin, imepenem and amikacin while *Klebsiella* spp. *Citrobacter* spp. and *Enterobacter* spp. show mild sensitivity to amikacin while *Acinetobacter* spp. sensitive to Imipenem because non *E.coli* group is normally found in the soil and water and its often hospital acquired infection associated with antibiotic usage and debelating statue, antibiotic treatment prior to hospitalization was also a risk factor for non-*E coli* UTI.[14] This treatment may have

selected for non-*E coli* bacteria and colonization by more resistant organisms, these results agree with Mahmut, et al., since amikacin maintains its efficacy against *E.coli* bacteria without any decrease in its effectiveness with time, it can be preferred in the treatment and higher rates of resistance suggest that 3rd generation cephalosporin should not be preferred for the empirical treatment [15].

Conclusion

E.coli has a higher prevalence of pediatric urinary tract with VUR followed by non *E.coli* group. Antibiotic resistance is higher in current study.

Table (1) Distribution of cases to causative agent in relation to gender

gend er/mi crob.	<i>E. coli</i>		<i>Proteu s spp</i>		<i>Pseu domon as aeurogenos</i>		<i>Klebsie lla sp.</i>		<i>Acino</i>		<i>Entrob acter sp</i>		<i>Citrob acter sp.</i>		Test of signifi cant
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Male	17	44.8	42	92	50	6	42	4	50	3	42	6	1	33	chi ² = 0.38 8 df=6 p> 0.05
Femal e	21	55.2	57	1	2	50	8	57	4	50	4	57	1	66	
Total	38	100	100	4	10	14	10	8	10	7	10	14	3	10	

Table (2) Distribution of cases according to age groups in relation to causative agent.

gend er/mi crob.	<i>E. coli</i>		<i>Proteu s spp</i>		<i>Pseu domon as aeurogenos</i>		<i>Klebsie lla sp.</i>		<i>Acino</i>		<i>Entrob acter sp</i>		<i>Citrob acter sp.</i>		Test of signifi cant
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
>1 yr.	15	39.5	4	28.6	3	37.5	2	28.6	1	25.0	1	25.0	1	33.3	chi ² = 0.19 93 df=1 2 p> 0.05
1-5 yr.	13	34.2	6	42.8	2	25.0	4	27.1	2	50.0	1	25.0	1	33.3	
6- 12yr.	10	26.3	4	28.6	3	37.5	1	14.3	1	25.0	2	50.0	1	33.3	
Total	38	100	14	100	8	100	7	100	4	100	4	100	3	100	

Table (3a) Gram negative bacteria isolation that sensitive to some Antibiotics

Microorganism	No.	perc ent	AK	Am	AX	P	Gen	lpm	Naif
<i>E. coli</i>	38	64.4	84.2	5.3	2.6	5.3	42.1	73.7	50
<i>Proteus spp</i>	23.8	14	57.1	0	14.3	0	85.7	71.4	14.3
<i>Pseudomonas aeurogenos</i>	8	13.6	66.7	0	33.3	0	87.5	50	0
<i>Klebsiella sp</i>	7	11.9	57.1	0	0	0	28.8	57.1	57.1
<i>Entrobacter sp</i>	4	6.8	50	50.0	0	0	25	25	0
<i>Acinetobacter spp.</i>	4	6.8	25	0	0	0	50	100	0
<i>Citrobacter sp</i>	3	5.1	66.7	0	0	0	0	66.7	66.7

AK=Amikacin ,AM=Ampicillin, Ax=Amoxicillin, P =PenicillinG, G=Gentamycin, lpm=Imipenem,Nif=Nitrofurantoin,

Table (3b) Gram negative bacteria isolation that sensitive to some Antibiotics

Microorganis m	No.	percen t	Cpm	Cfx	Pt	Cot	Cip
E. coli	38	64.4	3.4	5.3	0	7.9	2.6
Proteus spp	14	23.8	14.3	14.3	0	33.3	0
Pseudomonas aeurogenos	8	13.6	50	12.5	37.5	0	0

<i>Klebsiella sp</i>	7	11.9	42.9	14.3	0	0	0
<i>Enterobacter sp</i>	4	6.8	25	0	0	25	0
<i>Acinetobacter spp.</i>	4	6.8	0	0	0	0	0
<i>Citrobacter sp</i>	3	5.1	0	0	0	33.3	0

Cpm=Cefpime,Cfx=Cefixime,Pt=Pipracillin,Cot=Trimethoprim,Cip=Ciprofloxacin

Table (4) Gram negative bacteria isolation that resistant to some Antibiotics

Bacteria	No.	percent	AMC	Ctr	Caz
<i>E.coli</i>	38	64.4	100.0	100.0	100.0
<i>Proteus spp</i>	14	23.8	100.0	100.0	100.0
<i>Pseudomonas aerogenos</i>	8	13.6	100.0	100.0	100.0
<i>Klebsiella sp</i>	7	11.9	100.0	100.0	100.0
<i>Enterobacter sp</i>	4	6.8	100.0	100.0	100.0
<i>Acinetobacter spp.</i>	4	6.85.1	100.0	100.0	100.0
<i>Citrobacter sp</i>	3	5.1	100.0	100.0	100.0

AMC= Augmentin, Ctr=Ceftriaxone, Caz=Ceftazidime

References

- David A. Bergman, Richard D. Baltz, James R. Cooly. Practice parameter: The diagnosis, treatment, and evaluation of the initial urinary tract infection in febrile infants and young children. American Academy of Pediatrics. Committee on Quality Improvement. Subcommittee on Urinary Tract Infection. Pediatrics. 1999;103: 843-52. [PubMed]
- Cleper R., Krause I., Eisenstein B., Davidovits M. Prevalence of vesicoureteral reflux in neonatal urinary tract infection. Clin. Pediatric (Phila) 2004; 43:619-25. [PubMed]
- Leonard G. Feld, Tej K. Mattoo. Urinary Tract Infections and Vesicoureteral Reflux in Infants and Children : American Academy of Pediatrics, 2010. November 2010 vol.31 ISSN11
- Jennifer Sung and Steven Skoog. Surgical management of vesicoureteral reflux in children .Pediatr Nephrol. 2012 Apr; 27(4): 551-561. Published online 2011 Jun 22. doi: 10.1007/s00467-011-1933-7
- Rosenberger L.H., Hranjec T., Politano A.D., Swenson B.R., Metzger R., Bonatti H., Sawyer R.G. Effective cohorting and "superisolation" in a single intensive care unit in response to an outbreak of diverse multi-drug-resistant organisms. Surgical Infections, vol. 12, no. 5, pp. 345-350, 2011. View at Publisher • View at Google Scholar • View at Scopus
- Bauer A.W., Kirby W.M., Scherris J.C., Turch M. Antibiotic susceptibility testing by a standardized single method. Am. J. Clin. Path (1966); 45:493-96
- Chand D.H., Rhoades T., Poe S.A., Kraus S., Strife C.F. Incidence and severity of "vesicoureteral reflux in children related to age, gender, race and diagnosis. J Urol. 2003 Oct; 170(4 Pt 2):1548-50.
- Hibino S., Fukuchi K., Abe Y., Hoshino A., Sakurai S., Mikawa T., Fuke T., Yoshida K., Itabashi K. [Four infants with upper urinary tract infection due to extended-spectrum beta lactamase (ESBL)-producing Escherichia coli]. Kansenshogaku Zasshi. 2011 Sep; 85(5):481-7.
- Svante Swerkerson, Ulf Jodal, Christina Åhrén, Rune Sixt, Eira Stokland, Sverker Hansson. Urinary tract infection in infants: the significance of low bacterial count. Pediatric Nephrology, February 2016, Volume 31, Issue 2, pp 239-245.
- Friedman S., Reif S., Assia A., Levy I. Clinical and laboratory characteristics of non-E coli urinary tract infections Arch Dis Child. 2006 Oct; 91(10):845-846.
- Manisha Sahay. Urinary tract infections in children: Consensus and controversies Department of Nephrology, Osmania Medical College and General Hospital, Hyderabad, Andhra Pradesh, India Year: 2012 , Volume : 2, Issue : 1, Page : 1-3
- Johnson J. R., Scheutz F., Ulleryd P. et al. Host-pathogen relationship among Escherichia coli isolates recovered from men with febrile urinary tract infection. Clin. Infect. Dis 2005; 40(13):822-822 [PubMed]
- Gottesman B., Carmeli Y., Shitrit P., Chowers M. Impact of quinolone restriction on resistance patterns of Escherichia coli isolated from urine by culture in a community setting. Clin Infect Dis. 2009 Sep 15; 49(6):869-75.
- Ranjana Badhan, Dig Vijay Singh, Lashkari R. Badhan, Anureet Kaur. Evaluation of bacteriological profile and antibiotic sensitivity patterns in children with urinary tract infection: A prospective study from a tertiary care center. Indian J Urol. 2016 Jan-Mar; 32(1):50-56.
- Mahmut Abuhandan, Bülent Güzel, Yeşim Oymak, Halil Ciftci Antibiotic sensitivity and resistance in children with urinary tract infection in Sanliurfa. Turk J Urol. 2013 Jun; 39(2):106-110.