

Frequency of Vesicoureteral Reflux in Children having Recurrent Urinary Tract Infections

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Abstract

Objective: Repeated urinary tract infections are significantly related to anatomical abnormalities of urinary tract. Vesicoureteral reflux is quite common, under diagnosed anatomical abnormality, leads to renal scarring and chronic kidney disease. The objective of the study was to determine the frequency of vesicoureteral reflux in children having repeated urinary tract infections.

Methods: It is cross sectional survey conducted in department of Pediatric Medicine, The Children's Hospital & Institute of Child Health, Lahore, spanning from 20-5-2014 to 19-11-2014, using non-probability purposive sampling, a total of 140 patients included. Each child was screened and followed with repeated urinary tract infections for frequency of vesicoureteral reflux by detailed clinical examination and relevant investigation as defined in operational definition. To avoid any controversy, all the findings of UTI & vesicoureteral reflux was assessed by a single consultant. Data was managed using SPSS version 20.

Results: In this study the mean age of all patients was 5.64 ± 2.35 years. There were 42 (30%) males and 98 (70%) females in this study with male to female ration 1:233. The mean number of episodes of urinary tract infections was 5.82 ± 1.95 per years. Frequency of vesicoureteral reflux in these patients was seen in 35 (25%) of the patients. When we stratified the data over age, gender and number of episodes of urinary tract infection we found significant association of vesicoureteral reflux with age groups only (p -value < 0.05) while no association between vesicoureteral reflux versus gender and number of episodes of urinary tract infection (p -value > 0.05).

Conclusion: We found significant correlation between vesicoureteral reflux and repeated urinary tract infections. Cases with repeated urinary tract infections should be investigated thoroughly to address underlying cause, in order to prevent renal damage and long-term complications.

Key Words: Paediatric, Urinary tract infections, hydronephrosis, Vesicoureteral reflux

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Introduction

In paediatric population, urinary tract infections (UTI) are commonly seen. Symptoms for UTI include anorexia for fever, lethargy, urinary complaints and vomiting.¹ 5% of children with repeated UTI are at risk of renal damage.² Children with UTI can present with pyelonephritis, urethritis or cystitis.³

There are different organisms responsible for UTI, Escherichia coli in almost 80% of total cases.⁴ Other include klebsiella, pseudomonas aeruginosa, enterobacter, and proteus.⁵ UTIs and some congenital abnormalities may cause renal scarring.⁶ Vesicoureteral reflux (VUR) is one of the common congenital anomalies, in which there is backward flow of urine from bladder towards kidneys. VUR is seen in 30 to 50% of children that are diagnosed with infections of urinary tract.⁷ VUR causes hydronephrosis, increase risk of UTI and in presence of bacterial infection causes pyelonephritis. Kids suffering from hydronephrosis may require daily dose of antibiotic for prevention of UTI or surgical correction.⁷

VUR prevalence is between 22.7% to 26.4% in children, suffering from UTI.⁸ Urine tract related

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congenital abnormalities should be suspected and diagnosed promptly in order to prevent irreversible renal damage. Renal ultrasonography, voiding cystourethrography (VCUG), Tc-99m Diethylene-triamine-penta-acetic acid (DTPA) Scan, Dimercaptosuccinic acid Scan (DMSA) are used to diagnose urinary tract congenital abnormalities and extent of renal damage.³ Purpose of this study was to see frequency of vesicoureteral reflux in children with recurrent UTI. Whereas, Urinary tract infection was defined as pure growth of micro-organisms of >105 organisms/ml on urine culture. Recurrent urinary tract infection was defined as urinary tract infection twice in 6 months or ≥ 3 times in 1 year on urine culture. Vesicoureteral reflux was characterized by the retrograde flow of urine from the bladder into ureters or kidneys and was assessed by voiding cystourethrogram (VCUG) in terms of whether being present or not.

Inclusion Criteria

1. Patients fulfilling operational definition of recurrent urine tract infections.
2. Age between 2 to 10 years
3. Both genders

Exclusion Criteria

1. Children with known congenital anomalies of the kidney/urinary tract or having multiple anomalies like syndromic patients e.g. Down's syndrome

Methods

This was cross sectional survey conducted in Department of Pediatric Medicine, The Children's Hospital & Institute of Child Health, Lahore with duration of Six months spanning from 20-5-2014 to 19-11-2014. Sampling technique was non probability, purposive with estimated sample size, calculated with 95% confidence level, 7% margin of error with an expected VUR frequency of 22%, is 140 children.⁸ After an informed consent, patients fulfilling the inclusion criteria were enrolled. Collected data was entered and analyzed using statistical software SPSS version 20. Mean and ±SD was calculated for quantitative variables like age, number of episodes of urinary tract infections. Frequency tabulation and percentage was done for qualitative variables like vesicoureteral reflux in recurrent urinary tract infections. Data was stratified for age, gender and number of episodes of

urinary tract infection. Chi-square test was applied post stratification with p-value ≤ 0.05 considered as significant.

Results

In this study the mean age of all patients (n=40) in this study was 5.64±2.35 with age range of 8 years (minimum age=2 and maximum age=10 years). The mean number of episodes of urinary tract infection was 5.82±1.95 with minimum and maximum number of urinary tract infection per years. (**Table 1**). When we stratified the data over age, gender and number of episodes of urinary tract infection we found that, among 35 patients with vesicoureteral reflux, there were 12(34.3%) patients who were 2-5 years of age and 23(65.7%) patients were 6-10 years of age. There was significant association between vesicoureteral reflux and age groups of the patients, p-value 0.004. There was no significant association between vesicoureteral reflux and gender, p-value=0.523. Likewise, there was no statistical association between vesicoureteral reflux and number of episodes of urinary tract infection, p-value= 0.481.

Table 1: Descriptive Statistics of Age (Years) and Number of Episodes of Urinary Tract Infection

	Mean	Std. Deviation	Range	Min.	Max.
Age (years)	5.64	±2.35	8	2	10
Number of episodes of urinary tract infection	5.82	±1.95	6	3	9

Table 2: Frequency and Comparison of Vesicoureteral Reflux with Respect to Age (Years), Gender and Number of UTI Episodes Frequency Distribution of Vesicoureteral Reflux in Recurrent UTI Patients

	Yes	No		
	35 (25%)	105 (75%)		
Comparison of Vesicoureteral Reflux with Respect to Age (Years), Gender and Number of UTI Episodes				
		Vesicoureteral reflux		p-value
		Yes	No	
Age groups (years)	2-5	12(34.3%)	65(61.9%)	0.004
	6-10	23(65.7%)	40(38.1%)	
Gender	Male	12(34.3%)	30(28.6%)	0.523
	Female	23(65.7%)	75(71.4%)	
Number of episodes of urinary tract infection	3-6	20(57.1%)	67(63.8%)	0.481
	7-9	15(42.9%)	38(36.2%)	

Discussion

If urinary tract abnormalities like vesicourethral reflux is diagnosed earlier in patients with repeated UTI the damage in kidney can be prevented either with prophylactic antibiotics or with corrective surgery.⁹ Symptoms for UTI in older children can be of urinary origin but in younger kids symptoms are usually nonspecific and sometime in infants they are difficult to observe. Urine dipstick analysis is important for ruling out of UTI in patients having low level of clinical suspicion. Although Urine culture is gold standard for diagnosis of UTI in children having high suspicion clinically, cloudy urine, positive leukocyte esterase or positive nitrate activity in case of urine dipstick analysis.¹⁰

For diagnosis of repeated UTIs related morbidities, we need detailed history, physical examination, renal as well as bladder sonography urine analysis and culture and contrast cystography, beside assessing other risk factors like bacterial virulence, antibiotic resistance.¹¹

3% of girls in prepuberty phase and 1% of boys in prepuberty phase are diagnosed with UTI. The incidence for urine infection in childhood and infancy is high and also influenced by gender and age.¹² Average age for subjects was 27.15 ± 20.72 months.¹³ 80(81.8%) males along with 18(18.2%) females were included. Most subjects were of age 01.00 to 24.66 months in one study.¹³ In our study average age of subjects was 5.64 ± 2.35 yrs. There were 42 (30%) males and 98(70%) females in this study with male to female proportion 1:2.33.

Risk of recurrent UTI is high in children anomalies like vesicoureteral reflex and neurogenic bladder or with poor hygiene habits.¹⁴ In this study average number for episodes of UTI was 5.82 ± 1.95 with maximum and minimum number of UTI per years.

Primary vesicoureteral reflux is congenital with normal functioning of lower urinary tract, on other hand secondary vesicoureteral reflux is due to obstructive cause like posterior ureteral valve or neurogenic bladder.¹⁵ Precise frequency for vesicoureteral reflux is not known because several children are asymptomatic but vesicoureteral reflux frequency is much higher in children suffering from repeated UTI 15-70%.^{13,15,16,17}

In this study stratification of data was done for gender, age and episodes of UTI, we observed that in

35 patients suffering from vesicoureteral reflux 12(34%) patients are with age group (2 to 5 years), whereas 23(65.7%) of are with age group (6 to 10 years). There is strong relationship between to the age and vesicoureteral reflux (p-value 0.004). There is no statistically significant relationship between gender, number of urine tract infections with vesicoureteral reflux.

We made conclusion from our study that congenital abnormalities of urine tract must be looked for in any age group of children presenting with repeated UTI, irrespective of gender and number of urine tract infections. Vesicoureteral reflux should be promptly suspected and treated accordingly, in order to prevent renal scarring.¹⁸

Conclusion

We found significant correlation between vesicoureteral reflux and repeated urinary tract infections. Children with repeated urinary tract infections should be investigated thoroughly to address underlying cause, in order to prevent irreversible renal damage and long-term complications.

Conflict of Interest: None

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Author's Contribution

AI: Data Collection

SAM: Conceptualization of Project, Writing of Manuscript

ZF: Literature Search

QH: Drafting