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Incidence and Risk Factors of VUR in Patient with UTI, Nephrology Unit, Tripoli Children Hospital-Libya

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ABSTRACT

Vesicoureteral reflux (VUR) is defined as back word flow of urine from the bladder to the ureters. It is a common finding among children with urinary tract infections (UTIs). The aims of the study are to determine the occurrence of VUR among children presented to Tripoli Children Hospital with UTI and to find the relationship between VUR and sex, age, type of UTI, ultrasound (U/S) finding as well as renal scar on DMSA scan.

Retrospectively, from January, 1993 to September, 2008 a total 600 children with documented UTI were included in this case serious study. Only those who underwent voiding cystourethrography (VCUG) were included, whereas children with evidence of urinary tract obstruction, neurogenic bladder, presence of renal impairment or renal stones were excluded.

600 children, 134 (22%) were males and 466 (78%) were females. The mean age is 3.27 ± 2.8 years (range from 0.1 to 13 years). VUR were found in 217 (36.2%) children, out of them 152 (70%) were females. VUR is more common in children younger than 2 years of age 115(53%) and it is more in children presented with acute Pyelonephritis (APN) 172 (78%). However 66 (83.5%) of children with APN had high grade reflux. 106 (53%) of children with VUR had abnormal renal ultrasound (U/S) finding as well as 70 (61.4%) of them had renal scar by DMSA scan.

Conclusion: 36.2% of children with documented UTI referred to Tripoli Children Hospital had VUR. It is more common in females, younger age and more common in children presented with APN. There is high incidence of renal scaring among children with high grade reflux.

Keywords - *UTI; Renal U/S; DMSA scan; VUR.*

INTRODUCTION

Urinary tract infection (UTI) is one of most common bacterial infection during childhood.[1] It has been estimated that 8% of girls and 2% of boys will have a UTI during childhood.[2] Primary vesicoureteral reflux (VUR) is defined as the back-ward flow of urine from the bladder to the ureters due to a congenital anomaly with an increasing the risk of repeated pyelonephritis and consequently renal scaring, hypertension and renal failure (reflux nephropathy).[3] The prevalence of vesicoureteral reflux (VUR) is 30% to 40% in children with UTI and appears to decrease with age.[4] It is documented that VUR is a predisposing factor for UTI, which in turn may involve the kidney parenchyma and cause permanent renal scarring.[5] The severity of VUR is graded according to the international study classification from grade I-V, based on the appearance of the urinary tract on contrast voiding cystourethragraphy (VCUG).[6] Most children with high-grade reflux (grade IV-V) who acquire a UTI are at significant risk for pyelonephritis and renal scarring.[7] The relationship between presence of VUR reflux and renal scaring by dimerccaptosuccinic acid scan (DMSA) is well documented especially in those children with high grade reflux.[8]

The aims of the study are to determine the occurrence of VUR among children with UTI at Tripoli Children Hospital and to investigate the relationship between VUR and sex, age, type of UTI, U/S finding as well as renal scar on DMSA scan.

MATERIALS AND METHODS

This is a descriptive (case serious) study. A 600 children with documented UTI (history of acute Pyelonephritis (APN) or history of recurrent UTI) presented to nephrology Unit at Tripoli Children Hospital from January, 1993 to September, 2008 who underwent voiding cystourethrography (VCUG) were selected those children with evidence of urinary obstruction, neurogenic bladder, presence of renal failure or renal stones were excluded. Tripoli Children Hospital is a referral hospital covering 2/3 of paediatric services in Libya. Only children who underwent VCUG were included. The following demographic information was recorded on each child: age at presentation, gender, indications of VCUG, U/S finding and presence of renal scar by DMSA scan. According to nephrology unit regulations VCUG done after three weeks of negative urine culture, the indications of VCUG were include; all children with documented APN or recurrent UTI who were less than 2 years of age, children

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presented with APN, positive U/S finding, positive family H/O VUR and positive renal scar on DMSA in children between 2 to 5 years of age and also in children with positive renal scar by DMSA after 5 years of age. Age was divided into three groups, children less than two years of age, children between two and five years of age and those children who were more than five years of age at time of presentation. APN diagnosed on bases of clinical presentation of high grade fever, laboratory evidence of leucocytosis, high ESR, raised CRP, and positive urine culture. The severity of VUR is graded according to the international study classification from grade I-V, based on the appearance of the urinary tract on contrast voiding cystourethragraphy (VCUG).[6] VUR were divided into low grade (grade I, II, III) reflux and high grade (grade IV, V) reflux. Renal ultrasonography (U/S) done to all children at time of diagnosis of UTI, dilated renal pelvis indicate positive U/S finding. Renal scaring detection was done by dimercaptosuccinic acid scintigraphy (DMSA) which done to only 310 (51.7%) of total 600 children as indicated after 3 to 6 months from diagnosis of UTI. These children were followed up in nephrology unit at Tripoli Children Hospital.

Statistics analysis

After data collected they were coded and transferred into the statistical package for the social sciences (SPSS), version 12. Results are expressed as either means ± SD for continuous variables and percentage for categorical variables. The statistical tools used like frequencies, and chi-square test. The level of significance was set at *P* value < 0.05 in all cases.

RESULTS

The study includes 600 children, 134(22%) were males and 466(78%) were females. The mean age at presentation was 3.27 ± 2.8 years (range was from 0.1 to 13 years). The age at presentation was divided into three groups: 267(44.5%) children below 2 years of age, 213(35.5%) children between 2 to 5 years of age and 120(20%) children were more than 5 years of age (Figure 1).

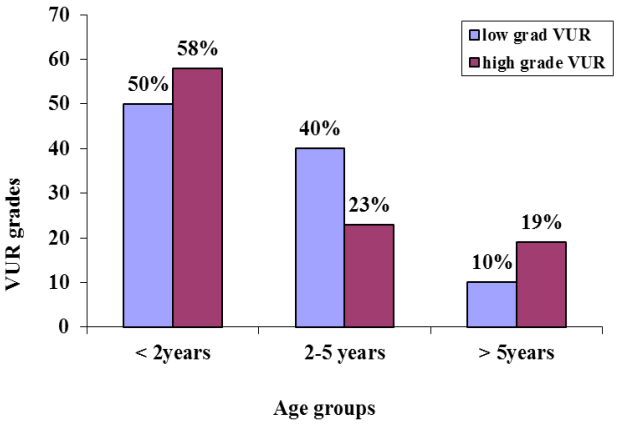

Figure 1: Sex distribution versus age group.

All children with documented urinary tract infection were included. APN accounted for 414(69%) and 186(31%) children presented with recurrent UTI. VUR found in 217(36.2%) equal to 316 renal unit. 152(70%) children were females. 72(33.2%) renal unit involved in left side, 46(21.2%) renal unit involved in right side and 198(45.6%) renal unit were bilaterally. VUR graded according to international reflux study classification (Table 1).

Low grade (VUR grade I, II, III) accounted for 138(63.6%) children and high grade refluxes (VUR grade IV, and grade V) were accounted for 79(36%) children.

The relationship between the incidences of VUR to other variables like: sex, the VUR is more in females 152(70%) than males 65(30%) and it is highly statistically significant (*P* value < 0.05). The high grade reflux is also more in females than males however; it does not show any statistically significant between the types of VUR grading and the gender of our children (*P* value 0.3).

The relationship of presence of VUR to the age groups at time of presentation, there is highly statistically significance difference between grades of VUR and age groups at presentation. VUR is more in children < 2 years of age 115(53%) than in children between 2 to 5 years and > 5 years of age, 73(33.6%) and 29(13.4%) retrospectively, (*P* value < 0.01) (Figure 2).

Table 1: VUR grads in relation to sex

VUR grades	Frequency		Male		Female	
	(n)	(%)	(n)	(%)	(n)	(%)
I	12	(5.5)	5	(2)	7	(3)
II	50	(23)	11	(5)	39	(18)
III	76	(35)	24	(11)	52	(24)
IV	56	(26)	14	(7)	42	(19)
V	23	(11)	11	(5)	12	(6)
Total VUR	217	(36.2)	65	(30)	152	(70)
No VUR	383	(63.8)				
Grand total	**600**					

VUR: Vesicoureteric reflux

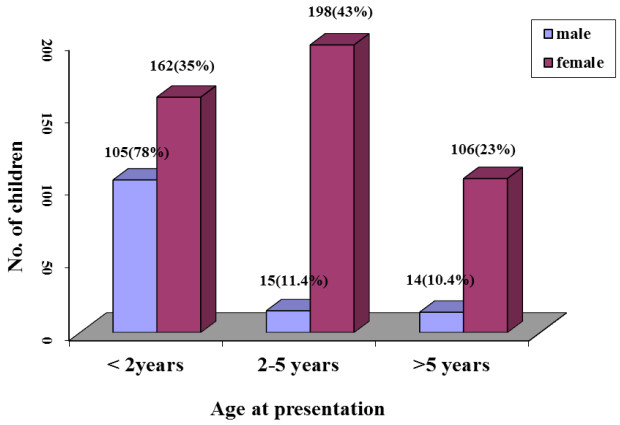

Figure 2: Number of children versus age at presentation.

The occurrence of VUR was found more in children presented with APN 171(78.8%) as compared to those children presented with lower UTI 46(21.2%). On the other hand when correlating the grades of VUR with the type of UTI at presentation; the high grade reflux is more in children with APN 66(83.5%) as compared to children with lower UTI 13(16.5%). At the same time low grade reflux is more in children presented with APN 105(76.1%) than in children with lower UTI 33(23.9%), both are highly statistically significant (*P* value < 0.02).

241(40%) children (320 renal units) showed abnormal U/S finding at time of diagnosis. Of the group, 116(48%) had VUR and 125(52%) had no VUR. 359(60%) children with normal U/S finding 258(72%) had no evidence of VUR and 101(28%) had VUR. 81(59%) of children with low grade reflux had normal U/S finding and 57(41%) had abnormal U/S finding. However children with high grade reflux 20(25%) had normal U/S finding and 59(75%) children had abnormal U/S finding.

DMSA scan done to 310(51.7%) of total 600 children. Renal scaring was found in 157 (51%) children 194(61%) scaring kidney. 114 children with VUR had DMSA scan, of them 70(61.4%) of children with VUR had renal scar on DMSA scan. When correlating the incidence of VUR with the presence of renal scar on DMSA scan, there was highly statistically significance between the presence of renal scar by DMSA scan and presence of VUR (*P* value < 0.05). The relationship between renal scaring by DMSA scan and VUR grades, children with high grade reflux 76% of them had renal scar by DMSA scan and 24% of them had no evidence of renal scar. On the other hand children with low grade reflux grade reflux 54% of children had renal scar on DMSA and 46% had normal DMSA scan (*P* value 0.03).

DISCUSSION

Primary vesicoureteral reflux is a common urological problem in children. The long-term morbidity might be associated with reflux nephropathy due to presence of renal scar.[9] In this study the incidence of VUR is 36%, (45% had bilateral reflux) which is less than Saudi children 41.5 % (50% of them had bilateral reflux).[10] In Kuwaiti children the study include 174 children with UTI, 22% had VUR.[11] In previous study of 224 children presented in 2000 the incidence of VUR was only 29.5% which is different from this study because the total number of cases is higher than the previous one.[10] 642 cases studied on Turkish children to find out the relation between UTI and VUR they found the incidence of VUR was 24.6%.[12] The incidence of VUR in USA was 31%[13] the total no of cases was 94 and UK was 59%[14] the total no of cases was 128 cases.

The incidence of VUR was decreased with increased age. In many previous studies the cut off point for age was below one year however in this study the cut of point for age was 2 years. There is high incidence of VUR in children below 2years of age 115(53%) which is higher than the incidence reported by others.[10] It is well documented that VUR is more common in females than males in many previous studies, the same thing in this study the main reason for this is that UTI is more in females than males and also secondary causes of VUR were excluded from this study. The occurrence of VUR found more in children presented with APN 78.8% as compared to those children who presented with lower UTI 21.2%. This figure is different from Al-Ibrahim *et al.*[10] where 38% of children with APN had VUR. On other hand other study done on Turkish children with UTI oncluded that the prevalence of VUR did not differ significantly in those children present with APN or in children with recurrent UTI.[12] Regarding renal ultrasound findings they are neither sensitive nor specific for VUR detection in children with a first UTI.[15] The VCUG is necessary to rule out VUR, regardless of renal ultrasound findings. However in this study the relation between U/S finding and the VUR grading was highly statistically significant. In those children with low grade reflux 81(57%) children had normal U/S finding and 57(41.3%) had abnormal U/S finding on the other hand children with high grade reflux 20(25%) children had normal U/S finding and 57(75%) children had abnormal U/S finding (*P*<0.05). Renal scaring was 51% in our children presented in this study which is slight higher than Saudi children 45%.[10] Although the prevalence of renal scar as detected by DMSA in European and Australian children with UTI has been reported as varying between 29% to 42%.[13,14,16] This study showed high statistically significant between the presence of renal scar and high grade of VUR.

CONCLUSION

VUR is common among Libyan children presented with UTI. Its occurrence accounted for 36.2% in Tripoli Children Hospital. It is more common in girls than boys and more in children less than two years of age. There is high incidence of renal scaring in children with VUR especially in those children with high grade reflux.

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