Research Paper

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Clinical and Investigational Profile of Urinary Tract Infections in Pediatric Patients

Medical Science

KEYWORDS : Urinary tract infection, children,clinical symptoms,investigation

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ABSTRACT

Urinary tract infection is commom infection in children.A study of 60 cases were done,by clinical and investigaional criteria for uti.The most common age group was 5-12 years ,with female predominance.All children above 5 years of age had more urinary symptoms (45%with burning micturation and 26% with crying and straining during micturation.)while patients under 2 year of age had more non-urinary symptoms(fever 51%,abdominal pain 26%).The most commom organism found in urine culture was e.coli(75%),and klbsiella(13%).Most organisms showed maximam sensitivity to cefotaxime(96%),ceftriaxone(91%),amikacin(91%). Least sensitive drugs were ampicillin(76%) and cefadroxyl(80%).Radiological abnormality were detected in 23 cases.(38%).Mortality was nil in present study.

Introduction: Urinary tract infection is the 3rd most common bacterial infection in infants and children and the most common genitourinary disease in children1.Urinary tract infection is a group of conditions in which there is localization of infecting organism, anywhere in the urinary tract, from urethra to renal parenchyma and all have common features of presence of organisms in urine and it may be symptomatic or asymptomatic. It requires high index of suspicion for diagnosis, especially infants and neonates(due to vague symptoms and subtle clinical presentation), otherwise one can miss the diagnosis easily and it may progress to renal insufficiency and end stage renal disease. Approximately 3.5% girls and 1% boys acquire Urinary tract infection before 11th year of life[2].

Clinical presentation of urinary tract infection is also variable. Older children usually present with symptoms pertaining to urinary tract like burning micturation, frequency of mictuation, hematuria etc. While neonates, infants and young children present with systemic features like fever, lethargy, vomiting, weight loss. Diagnosis of urinary tract infection requires urine analysis (Routine and Microscopic) and urine culture. Along with this various imaging techniques like X-ray, Ultra sonography, Intravenous pyelography, Micturating cysto urethogram and renal scanning are required.

Material and method: Sixty established cases of urinary tract infection were selected in children below 12 years for this study at L. G. Gen Hospital, Ahmedabad during the period from 1st Jan 2014 to 31st Dec 2014 in children admitted to hospital and attending the pediatric outdoor department.A relevant and detailed history and physical examination was done in each and every patient of suspected urinary tract infection as per proforma of suspected urinary tract infection.Urine routine and microscopic examination was done in every patient. Microscopic examination showing more than 5 pus cells/hpf in centrifuged sample also have marked significance.In present study, taken only those patients as established UTI, in whom urine culture was positive(CFU >100000/ml), considering it as a gold standard method for diagnosis of urinary tract infection.USG was done of each and every patient,in case of abnorml USG,MCU and DMSA scan was done.in case of normal usg also MCU and DMSA scan was done,as per guidelines in children less than 5 years.

Observation and discussion: The present study includes 60 cases of confirmed bacterial urinary tract infection. Positive urine culture was taken as the absolute criterion for diagnosing urinary tract infection.

AGE AND SEX DISTRIBUTION

No.	Age group	Sex				Total N=60	%	M:F Ratio
		Male	%	Female	%			
1	0-1 month	3	5.00	0	-	03	5.00	-
2	1 month-2year	5	8.30	12	20.00	17	28.30	1:2.4
3	>2 year-5 year	4	6.60	8	13.40	12	20.00	1:2
4	>5year-12year	10	16.70	18	30.00	28	46.70	1:1.8
Total		22	37.00	38	63.00	60	100.00	1:1.7

Shows age an d sex distribution of patients, youngest patient was 15 days old neonate.All the neonates in this study were males. Female predominated in all the age groups except neonatal period.Maximum no. of cases were found in age group of 5-12 years i.e. 46.7%.Second most common group was >1 month –2 years eg. 28.3%.

Preponderance of <2 years age group was found by Garg[3], who observed 47% and Ethiraj4 who found 45% patients below 2 years. Most authors believe, high incidence in this age group because of longer period of contact with soiled napkin leading to ascending infection and complicating cogenital anomlaies commonly present during infancy.Male: Female ratio in the present study was 1:1.7.

A study, done by Shapiro et al5, he had also observed that except for neonatal period urinary tract infection is occur more frequently in females, UTI occur in male infants predominantly, whereas older infants and children, infection occur predominantly in females.As males are more susceptible to infections in general and as urinary tract infection in very young infants are generally due to hematogenous spread, it may be the possible explanation for male preponderance in this age group. Also congenital malformations are more common in male infants than in female infants it may also be the cause for male preponderance in neonate age group and infancy. The change of the sex ratio with age may be due to a successive functional maturation of some defense mechanism or disappearance of a predisposing factor developing at different rates in the two sexes.

The clinical presentation of urinary tract infection is extremely varied. There may be typical urinary symptoms and the child may have atypical symptoms or may be asymptomatic.

CLINICAL PRESENTATION

Symptoms	No of patients with age group and sex								Total N=60
	0-1m		1m-2yr		>2-5yr		>5-12yr		
	M	F	M	F	M	F	M	F	
Urinary	1	-	2	5	4	6	10	15	43
Others	2	-	4	7	4	8	7	16	46
Both urinary and others	1	-	2	4	3	2	4	13	29
Only urinary	-	-	-	1	1	4	6	2	14
Only others	1	-	2	3	1	6	3	3	19

CLINICAL FEATURES PERTAINING TO URINARY SYSTEM

Urinary Symptoms	Age group								Total N=60	%
	0-1m		1m-2yr		> 2 -5yr		>5-12yr			
	M	F	M	F	M	F	M	F		
Crying during micturation	2	-	3	4	2	3	1	1	16	26
Burning micturation	-	-	2	2	3	7	7	6	27	45
Straining during micturation	2	-	3	2	2	3	1	2	16	26
Freq of micturation	-	-	2	0	2	2	2	6	14	23
Stream disturbances	1	-	1	1	1	0	3	1	8	13
Incontinence of urine	-	-	0	0	0	0	0	1	1	1.6
Urgency of micturation	-	-	1	1	0	1	0	3	6	10
Pus discharge	-	-	1	0	0	1	1	5	8	13
Hematuria	-	-	1	3	3	0	3	1	8	13
Balloning of prepuce	-	-	2	0	0	0	0	0	2	3
Fiank pain	-	-	0	0	0	0	1	0	1	1.6
Retention of urine	-	-	0	0	0	0	1	0	1	1.6
Dysuria	-	-	0	0	1	1	2	1	5	8
Oliguria	-	-	1	1	1	1	0	1	5	8
Edema	-	-	0	2	0	0	0	0	2	3

CLINICAL FEATURES OTHER THAN URINARY SYMPTOMS

Other and systemic complaints	Age group								Total N=60	%
	0-1m		1m- 2yr		>2-5yr		>5-12yr			
	M	F	M	F	M	F	M	F		
Fever	3	0	2	1	1	7	6	11	31	51
Abdominal pain	0	0	0	0	2	2	3	9	16	26
Lethargy	2	0	0	0	0	0	0	1	03	5
Weight loss	1	0	0	0	0	1	0	0	2	3
Failure to thrive	0	0	0	0	0	1	0	0	1	1.6
Diarrhoea	0	0	1	1	0	1	0	0	3	5
Vomiting	1	0	1	1	0	1	0	7	11	16
Dehydration	0	0	0	1	0	0	0	0	1	1.6
Convulsion	0	0	1	0	0	0	0	0	1	1.6

Out of 60 cases in this study, 23.3% had only symptoms referable to urinary tract, 31.6% had symptoms referable to other than urinary tract. While 48.3% patients had both types of symptoms. As compared to males, females had a slightly higher incidence of urinary complaints.All the children above 5 years had higher incidence of some sort of urinary complaints. While non-urinary complaints/symptoms were more common below the age of 2 years. This same observation was also made by Garg.[3]According to Winberg6, children with upper urinary tract infection are more likely to manifest with nonsepific symptoms and fever, while lower urinary tract infection may have symptoms pertaining to urinary symptoms.Clinical presentation suggestive of urinary tract infection is more often seen in girls.Amongst urinary complaints, seen in the present study, the common ones were crying and straining during micturation, burning micturation, frequency of micturation, hematuria and pus discharge.All these symptoms were more common in age of 5 yrs and more except crying and staining during micturation and this was similarly observed by Garg[3] in his study.From the non-urinary presentation, fever was observed to be the commonest, present in 51% of patient, which is comparable to incidence of 70% reported by Ethiraj et al4, 87.8% by Garg[3].Other common finding were abdominal pain 26%, vomiting 16% and diarrhea 5%. In Ethiraj et al4, vomiting present in 36% and diarrhea in 22%. Whereas, in Garg's3 study, vomiting 10.1% and diarrhea 16.1% were found. Failure to thrive, weight loss and lethargy observed more common in younger children.Central nervous symptoms found in this study was convulsion in only 1.6% cases, the patient was having febrile convulsion.4 patients had renal angle tenderness in which all patients were above 2 years of age. Out of them, 2 had pyelonephritis and 2 had hydronephrosis.3 patients had palpable one kidney and 5 had palpable both kidneys. Out of them 1 had pyelonephritis. Rest had hydronephrosis due to VUR, vesical and renal calculi and posterior urethral valve.Urinary tract infection with congenital malformation usually starts with early first few months of life especially in newborns. In this study, out of 3 newborns one had complain of straining during micturation with stream disturbances with dribbling and was having pasterior urethral valve. Other 2 were having other symptoms than urinary and having septicemia also. Out of these 2, one was having PUJ obstruction but not having any urinary symptoms.In the newborn, generally it is believed that urinary tract infection is due to a generalized septicemia and endotoxemia and in the present study out of three, two newborns were having complain of fever, lethargy, wt loss, and vomiting. This has been reported by many authors.

ROUTINE AND MICROSCOPIC EXAMINATION OF CENTRIFUGED URINE

Total no. of cases	Total(n=60)
1. Physical appearance	
Normal	56
Abnormal	04
Red urine	4
Smoky urine	-
Presence of clots	-
2. Ph- Acidic	56
Alkaline	04
3. Specific gravity	
Normal	60
Low	0
4. Proteinuria	10
5. Hematuria	09
6. Pus cells / hpf	
Less than 5	06
5 to 10	14
More than 10	40
7. Casts	03
8. Bacteria (Gram stain)	03

In present study 56 patients had acidic urine. Alkaline urine was present in 4 patient, in 3 of them proteus was isolated. Proteinuria was detected in 10 patients. Out of these it was massive only in 2 patients. (One with acute glomerulonephaitis that is +2 to +3 and one with Nephotic syndrome that is +3 to +4.) Rest 8 patients had only trace to +1 proteinuria.10 patients had hamaturia, out of which 6 had only microscopic hematuria and 4 had both macro and microscopic hamaturia. 6 out of them had renal stone and four had simple urinary tract infection.Hamaturia usually occurs in cystitis and not in upper urinary tract infection. In present study, 16% had hamaturia. In Vehaskari et al7,

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study of 86 patients done, out of which 10% were having hematuria. .PYURIA is the presence of leukocytes (PUS cells) in urine. It has marked significance in diagnosing urinary tract infection, as it is cheap, easy and bedside. More than 5 leucocytes / high power field in centrifuged sample and more than 10 cells / hpf in uncetrifuged sample is usually accepted as indicating pyuria8. Taking the above criteria, 67% of patient had >10 pus cells/ hpf, 23% of patient had > 5 pus cells/ hpf and 10% of patient had <5 pus cells/ hpf in centrifuged sample in present study. In Hoberman et al9, they had found 91% patients with pyuria having ≥ 50,000 CFU/ml in culture.In present study, 90% patients had correlated with bacteruria in which pyuria detected.

ORGANISMS ISOLATED IN URINE CULTURE:

Organisms isolated	Presents study	
	No. (60)	% (100)
E.coli	45	75
Klebsiella	08	13.3
Proteus group	04	6.6
Pseudomonas	02	3.3
Staphylococcus (Coagulase +ve)	01	1.6
Enterobacteria	0	
Neisseria	0	
Streptococcus fecallis (enterococci)	0	
Mixed flora	0	

Monobacterial infection was encountered in all the cases in the present study. Five different strain were isolated, with Escherichia coli being the most common one, responsible in 75% of cases.A high incidence of E.coli infection has also been reported by Garg3 (53.2%), Ethiraj et al4 (54%), Prado V et al10 (74.2%) .Klebsiella aerogenes (13%) and Proteus group (6.6%) were the next common group to E.coli in the present study.It is comparable with study done by Garg3 in which Klebsiella were isolated in 18.3% and proteus 6.4%In one study.In vitro sensitivity testing shows that most effective drugs were, Cefotaxime(96%), ceftriaxone(91%), Amikacin(91%) and Nitrofurantoin(91%).Next most effective drugs were, Netilmycin, Norfloxacin, Gentamycin, Cotrimoxazole, Ciprofloxacin, Nalidixic acid.Least effective drugs were, Ampicillin(76%) and cefadroxyl(80%).In a study done by Garg3, the most effective drug were Nitrofurantoin (81.9% of E.coli, Klebsiella 58.8% and proteus 41.6%) Next effective drug was chloramphenicol.In Ethiraj et al4, they found good results with gentamycin, Kanamycin and Nitrofurantoin.

RADIOIMAGING INVESTIGATIONS

Type of investigation	No. of patients investigated	Normal	Abnormal
Plain X-ray abdomen	20	10	10
Ultrasonography (KUB)	60	37	23
IVP	7	3	4
MCU	32	24	8
DMSA scan	1	-	1
DTPA scan	1	-	1

DETAILS OF ABNORMALITIES DETECTED ON RADIO IMAGING INVESTIGATIOS

Nature of Abnormalities	No. of cases (n=60)
Posterior urethral valve	2
Hydronephrosis and Hydroureter Bilateral Right Left	 10 1 1
Renal and ureter Calculus –Single - Multiple	 3 2
Vesical calculus	2
VUR grade I II III IV V	- 4 3 1 1

Radiological investigations revealed abnormalities in 23 patients i.e. 38% cases.Out of these, 2 patients had posterior urethral valve with urinary tract infection.Renal and ureter calculi were found in 5 patients and in which 3 had single and 2 had multiple calculi.2 patients had vesical calculi with urinary tract infection. Out of total 7, 2 had recurrent urinary tract infection. Calculi may lead to obstruction to urine flow, stasis and recurrent urinary tract infection.One patient was showing renal parenchymal disease on ultrasonography presented with acute glomerulonephritis with urinary tract infection. He was a male with 7 yrs old. He was also having hypertension but after 4 weeks, he was normotensive and follow-up USG was also normal.

One patient was having bladder diverticulum which was detected in MCU, not in USG. Hydronephrosis and Hydroureter had been detected in 12 patients. Most of them were detected in patients having stone and associated with VUR.Vesicoureteral reflux was detected in 9 patients. It was detected in USG and in MCU. One patient, 11 month old male child, who was having PUV with bilateral hydroureter and hydronephresis with VUR gr III with recurrent urinary tract infection, DTPA scan was done which was showing small and hydronephrotic right kidney with negligible cortical function (only 12%) with good cortical function (88%) of left kidney. One another, female patient, aged 5 years was presented with recurrent urinary tract infection. (3rd attack). In ultrasonography, left sided VUR grade III was detected. MCU was showing VUR Grade III with hydroureter and hydronephrosis of left side with mild hyrdroureter and hydronephrosis of right side. DMSA scan was done and was showing small, barely visualized left kidney which was badly scarred and mildly enlarged right kidney with no cortical scarring with good cortical function.

In present study, 15% patients were having VUR.In a study done by Zaki et al11, MCU and DMSA scan were done in every patient and VUR (2/3 had gr I-II) was found in 22% and abnormal DMSA scans in 36% patients (Renal scars and acute pyelonephritis).In a study done by Goldman et al12, 8% patients were having VUR and abnormal DMSA scan was found in every patient having VUR gr III and above. They suggest that ultrasonography and MCU should be done routinely after initial urinary tract infection in male patients. Renal scan should be reserved for abnormal USG or case with VUR gr III or above.

Conclusion

The present study included 60 patients below 12 year of age having culture positive urine. All the patients were evaluated as per the algorithm recommended by IAP consencus guidelines, 2001. DMSA and DTPA scan were done whenever indicated and whenever patients could afford. The commonest age group with urinary tract infection was found in 5-12 years with the second common being more than 1 month to 2 years.Females dominated in all age groups except neonatal period in this study.All the children above 5 years of age had some type of urinary complaint, while symptoms not referable to urinary tract were more common in children under 2 years.The common urinary symptoms encountered were frequency, burning micturation, crying during micturation, straining, urgency dysuria, oliguria, hematuria, pus discharge and stream disturbances.Other prominent symptoms were fever, vomiting, diaarhoea, abdominal pain. Fever was the most common presentation, occurring in nearly half of the patients and abdominal pain and vomiting were second in prominence.Weight loss, lethargy and failure to thrive were seen in younger children.The most common organism found to be re-

sponsible for urinary tract infection was escherichia coli, isolated in 75% of patients. Other organisms isolated were Klebsiella, proteus and pseudomonas. Mixed bacterial infection was not observed in any of the cases.Most organisms isolated were sensitive to cefotaxime, ceftriaxone, nitrofurantion and amikacin. Radiological abnormalities were detected in 23 cases i.e. 38% cases. Major abnormalities detected were: 2 with posterior urethral valve, 5 with renal caculi and 2 with vesical calculi, 1 with bladder diverticulum and 9 with vesicoureteral reflux.DMSA and DTPA scan were done in 2 patients. In both the scan abnormalities were detected.Mortality during the present study was nil. Complications such as renal failure and hypertension were not found in any of the cases in the present study.

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