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Original Research Article

Risk factors for urinary tract infection in pediatric patients

Kavitha J.[1], M. A. Aravind[2]*, Ganesh Jayachandran[2], Sathiya Priya[2]

[1]Department of Pediatrics, PSG Institute of Medical Sciences, Coimbatore, Tamil Nadu, India
[2]Department of Pediatrics, Stanley Medical College Hospital, Chennai, Tamil Nadu, India

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***Correspondence:**
Dr. M. A. Aravind,
E-mail: aravindma2003@yahoo.co.in

ABSTRACT

Background: Urinary tract infection (UTI) is one of the common infections occurring in children causing significant morbidity and mortality. The knowledge about the risk factors helps in the management as well as preventing the recurrence of urinary tract infection. Hence this study aims to assess the various risk factors and profile of UTI.
Methods: In this prospective case control study conducted in tertiary care centre between July 2011 to August 2012, children with signs and symptoms suggestive of urinary tract infection and urine culture positive for UTI were included. Age and sex matched asymptomatic children were taken as control. Preformed questionnaire was given to each patient and the results were analysed.
Results: Among the 214 cases studied, 111 boys were not circumcised constituting 86.7%. Whereas the other risk factors like recent hospitalisation, recent catheterisation, common toilet usage, cleaning perineum from back to front, constipation, usage of tight underclothing, diaper usage, worm infestation, neurological abnormality, voluntary withholding of urine, reduced water intake constitute 9.3%, 0.5%, 19.6%, 17.4%, 18.2%, 0.9%, 7.9%, 26.2%, 3.7%, 33.6% and 34.6% respectively.
Conclusions: Recurrent infection was most often due to unresolved bacteriuria or persistent bacteriuria than reinfection. Signs like supra pubic tenderness and hypertension are very rare. Common organisms causing urinary tract infection in our study population are *E. coli* followed by Klebsiella, Proteus and Pseudomonas. The risk factors of UTI depend on socioeconomic status and cultural habits.

Keywords: Circumcision, Diaper usage, Risk factors, UTI

INTRODUCTION

In the world wide pediatric age group urinary tract infection remains as silent yet very frequently faced infection. It produces significant mortality and morbidity among pediatric population due to inconspicuous clinical manifestations. It results in significant morbidity by producing irreversible damage to renal system that can never be salvaged if not recognized and treated early. Hence early recognition of subtle symptoms and signs will definitely provide good outcome among patients suffering from urinary tract infection.

The etiology that predisposes to UTI is not very clear as not much studies are available worldwide to find the exact risk factors.[1] If exact risk factors are known knowledge about prevention of risk factors help in the management of urinary tract infection as well as prevent recurrence. The risk factors of UTI depend on socioeconomic status and cultural habits like perineal cleaning methods and diaper usage.[2-4] So, it is better to analyse the risk factors in specific cultural groups of different places so that the risk factors which is differing from population to population can be identified and different strategies can be formed for population with

different cultures. Hence this study is undertaken to assess the clinical, demographic profile of UTI patients in a hospital which is catering low socioeconomic group which comprises majority of labourers and analyse the risk factors which predisposes to UTI in this specific population.

This study aims to analyse the risk factors associated with urinary tract infection and analyse the clinical and demographic profile of urine culture positive urinary tract infection patients coming to our hospital.

METHODS

It is a prospective descriptive and case control study conducted in Tertiary care centre. Study was conducted for the period from July 2011 to August 2012.

Inclusion criteria

- Signs and symptoms suggestive of urinary tract infection
- Urine culture positivity.

Exclusion criteria

Age <2 years and >12 years.

Definition of cases and controls taken in risk factor analysis

Cases

- Children with any symptom or sign suggestive of urinary tract infection
- Children aged between two to twelve years
- Urine culture with significant growth

Controls

Age and sex matched children who are free of

- Any acute febrile illness
- Urinary symptoms
- Abdominal pain
- Vomiting.

Study design was made out and then Ethical committee approval was obtained. Children fulfilling the inclusion criteria of two to twelve years and symptoms suggestive of urinary tract infection were chosen. Informed written consent was taken from child's parent or guardian. Child's history was then recorded as answers to pre prepared questionnaire in a proforma and clinical examination was done and findings recorded. Risk factors for urinary tract infection were also asked with a questionnaire in the proforma. Then the parent or guardian was explained about how to collect a clean catch midstream urine sample and its importance.

For boys it was advised to wash genitalia with water then retract the prepuce gently and collect the midstream sample. For girls it was advised to wash genitalia with water then separate both labia and collect the midstream sample. The collected sample was immediately sent to microbiology laboratory and plating done within one hour. If the urine culture turns out to be negative the patient is excluded from the study.

If urine culture is positive, then the organism and sensitivity pattern was recorded. Repeat urine culture was done if there is mixed growth.

For risk factor analysis age and sex matched control children are taken. They must be free of

- Any acute febrile illness
- Urinary symptoms
- Abdominal pain
- Vomiting

The observations were then analysed. Risk factor analysis was done by binary logistic regression analysis.

RESULTS

Age in years

Among the 214 cases analysed in the study 64 children belonged to 2-5years of age constituting 29.9% and 150 children belonged to 5-12 years of age constituting 70.1.

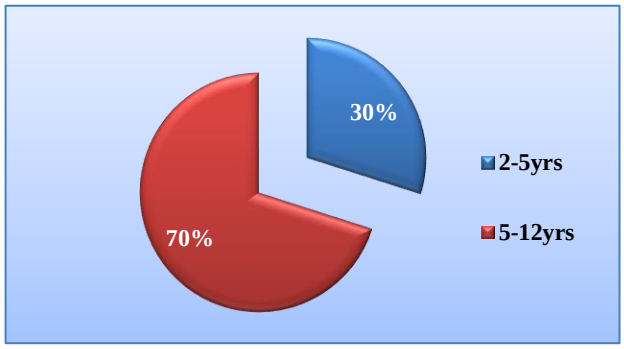

Figure 1: Age distribution.

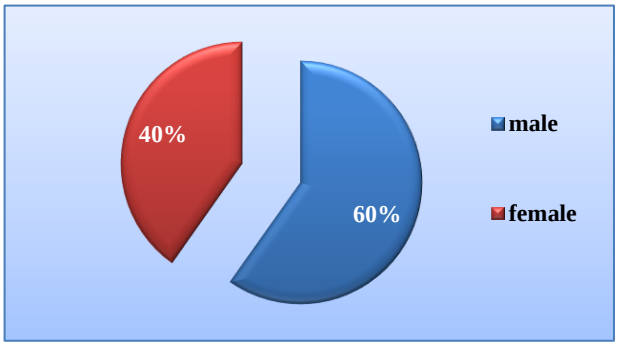

Figure 2: Sex distribution.

Sex distribution

In the total of 214 children 128 were male and 86 were female constituting 59.8% and 40.2% respectively.

Socio economic class

76 patients belonged to class V according to modified kuppusamy classification of socio economic class constituting 35.5% and 118 patients belonged to class IV constituting 55.1% and 20 patients belonged to class III constituting 9.3%. No patient was in class II or I.

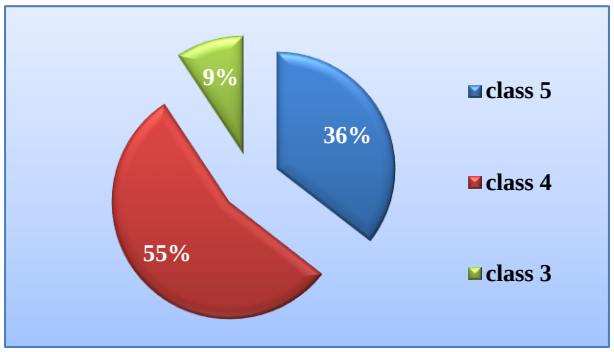

Figure 3: Socio economic class.

Locality

193 patients were from urban area and 21 patients from rural area constituting 90.2% and 9.8% respectively.

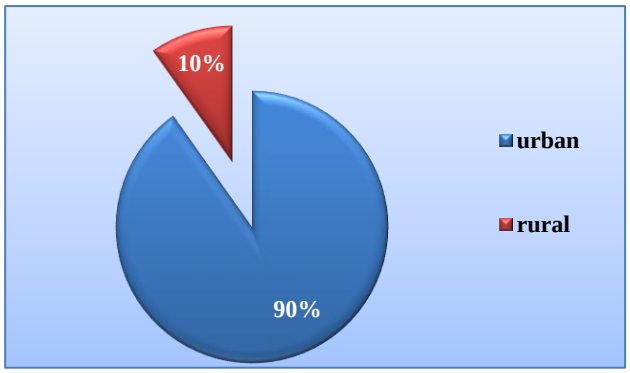

Figure 4: Locality distribution.

Risk factors

Among the various risk factors studied, 111 boys were not circumcised constituting 86.7%. Whereas the other risk factors like recent hospitalisation, recent catheterisation, common toilet usage, cleaning perineum from back to front, constipation, usage of tight underclothing, diaper usage, worm infestation, neurological abnormality, voluntary withholding of urine, reduced water intake constitute 9.3%, 0.5%, 19.6%, 17.4%, 18.2%, 0.9%, 7.9%, 26.2%, 3.7%, 33.6% and 34.6% respectively.

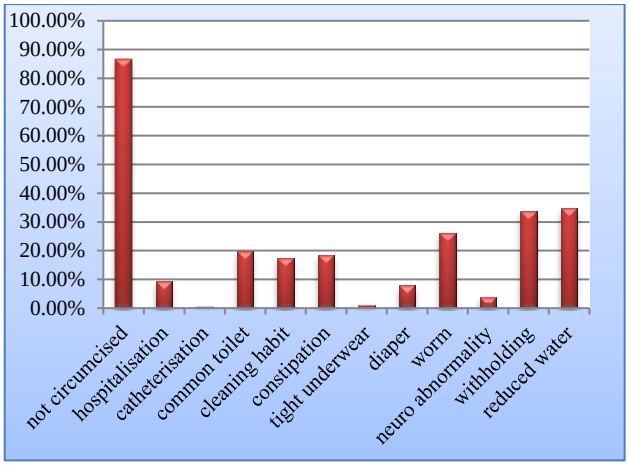

Figure 5: Risk factors.

Symptoms

Among 214 children 160 had fever history. 47 children had <3 days fever which is around 22% of total children and 3 to 5 days history was in 40 children constituting 18.7% and fever was present for >5 days in 73 children constituting 34.1%. Total fever cases summed up to 64.8% and is the most common symptom observed in the study.

Table 1: Symptoms.

Symptoms	n	%
Fever		
<3 days	47	22%
3-5 days	40	18.7%
>5 days	73	34.1%
Chills and rigor	86	40.2%
Burning micturition	86	40.2%
Increased frequency	111	51.9%
High coloured urine	9	4.2%
Cloudy urine	4	1.9%
Abdominal pain	98	45.8%
Vomiting	47	22%
Preputial bulging (males)	17	13.2%
Enuresis (>5yrs)	13	8.7%

Chills and rigor was present in 82 patients with fever and 4 patients without fever with a total of around 40.2%. Burning micturition history was present in 86 children which is around 40.2%. Children who couldn't say exactly about burning sensation complained about pain or irritation or cry during micturition. Increased frequency of micturition with small voids every time was present in 111 children constituting 51.9%.

High coloured urine history was present in 9 patients. 2 patients complained of passing blood in urine, 6 patients told of red coloured urine and one patient complained orange coloured urine. This constitutes around 4.2%.

Cloudy urine was noticed by parent in 4 patients constituting 1.9%. They told of cloudiness and sedimentation of passed urine. Abdominal pain was present in 98 patients constituting 45.8%. Vomiting was present in 47 patients which is around 22% of the total. History of preputial bulging while urinating was present in 17 boys out of 128 boys which is around 13.2%. Enuresis as a symptom was asked only for children more than five years of age and was present in 13 children out of 150 children constituting around 8.7%.

Clinical examination

Growth retardation was assessed by measuring height for age and anything <80% is considered severe retardation in growth (dwarf) according to Mclaren's classification. Growth was affected in 4 children constituting 1.9%.

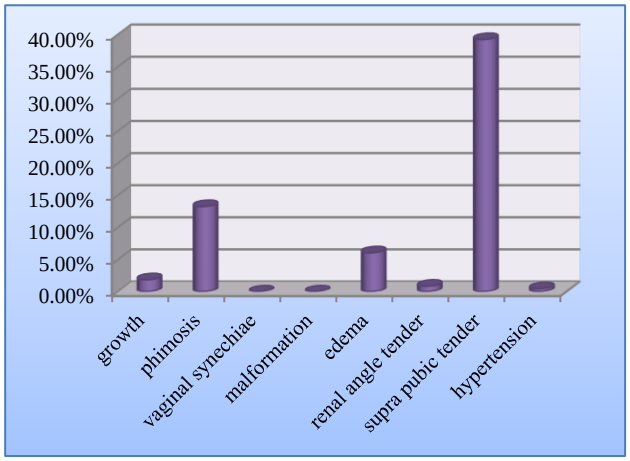

Figure 6: Clinical finding.

Phimosis was present in 17 boys out of 128 boys which is around 13.3%. Vaginal synechiae was not noticed in any child in study group. External urogenital malformation was also not present in any child. Edema in the form of facial puffiness which reduces as day progresses was present in 13 children which was around 6.1%. Renal angle tenderness was present in 2 children and it constitutes 0.9% of the total. Supra pubic tenderness was present in 84 chilren which was around 39.3%. Hypertension was present in 1 child constituting 0.5%.

Etiology

E. coli was grown in the urine culture of 98 children which was 45.8% of the total. This was the most common causative organism in the study group. This was followed by Klebsiella spp. in 51 children which is around 23.8%. 21 children's urine culture grew Proteus mirabilis which is around 9.8% of the total. Coagulase negative staphylococcus was grown in 9 children which constitutes 10.1%. *Staphylococcus aureus* was grown in 4 children which is 1.9% of the total. Enterococcus was grown in 17 children and Citrobacter in 1 child and this constitutes 7.9% and 0.5% respectively.

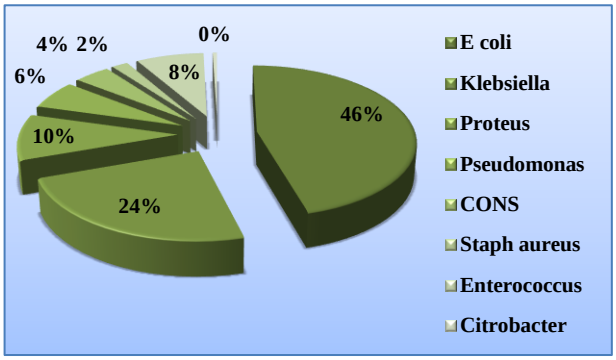

Figure 6: Etiology.

When binary logistic regression analysis was done for risk factors between cases and controls constipation, worm infestation, voluntary withholding of urine and reduced water intake were found to be significant risk factors causing urinary tract infection.

Table 2: Binary logistic regression analysis.

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
							Lower	Upper
REC_HOS	-0.013	0.416	0.001	1	0.975	0.987	0.437	2.231
REC_CAT	17.406	40192.970	0.000	1	1.000	36265960.436	0.000	-
COM_TOI	0.299	0.310	0.934	1	0.334	1.349	0.735	2.476
CONSTIPA	1.734	0.458	14.331	1	0.000	5.661	2.307	13.890
TIG_UND	-0.140	0.985	0.020	1	0.887	0.869	0.126	5.986
DIA_USA	0.399	0.446	0.800	1	0.371	1.490	0.622	3.567
WORM_INF	0.714	0.286	6.211	1	0.013	2.041	1.165	3.578
NEU_ABN	0.906	0.940	0.929	1	0.335	2.474	0.392	15.605
VOL_WH	2.641	0.407	42.164	1	0.000	14.024	6.320	31.119
RED_WAT	1.661	0.305	29.595	1	0.000	5.267	2.895	9.583
Constant	-0.844	0.763	1.222	1	0.269	0.430		

DISCUSSION

In this study urinary tract infection occurred more in male children than in female children. Studies done elsewhere, and literature do not support this. The probable reason for this difference is that the study being hospital based the proportion of male and female children attending our hospital may be different.

In this study majority of children belonged to low socio-economic status and were from urban area and the analysis is targeted to this group of the community.

On analysing the clinical profile of the study group fever was the most common presenting symptom with 64.8% of the children presenting with it. This is followed by increased frequency of urination which was seen in 51.9%. The third common symptom was abdominal pain which constituted 45.8%. This is similar to other study by Sharma A et al which included children from two months to fifteen years conducted in Nepal except that the second common presentation was abdominal pain.[5]

Malla KK et al, Islam MN et al and Brkic S et al showed fever as most common presenting complaint in their studies.[6-8] Supra pubic tenderness was the most common clinical finding, but it was seen only in 39.3% of children. Majority of children presented as fever without focus in correlation with literature. All children with supra pubic tenderness dint have cystitis in USG and all children with cystitis dint have supra pubic tenderness.

Table 3: Comparison of symptoms.

Symptom	Present study	Sharma A et al	Gamier A et al	Qureshi AM et al
Fever	64.8%	65%	63.6%	92%
Increased frequency of urination	51.9%	37.5%	57%	-
Abdominal pain	41.8%	42.5%	12.1%	
Dysuria	40.2%	-	-	68%
Vomiting	22%	20%	-	-

None of the children had external urogenital malformation. This may be because children <2 years were excluded from the study.

Table 4: Comparison of etiology.

Organism		Sharma A et al	Akram M et al
E. coli	45.8%	67.5%	61%
Klebsiella	23.8%	20%	22%
Proteus	9.8%	10%	
Psedomonas	6.1%	2.5%	4%

Most common causative organism was *E. coli* (45.8%) followed by *Klebsiella*, *Proteus* and *Pseudomonas* constituting 23.8%, 9.8% and 6.1% respectively. This is comparable with the study by Sharma A et al from Nepal and Akram M et al from Aligarh, India.[5,9]

Studies by Mantadakis E et al and Islam M et al showed *E. coli* as most common organism but with varying proportions.[7,10] In the risk factors analysis worm infestation, constipation, voluntary withholding of urine and reduced water intake had statistically significant difference from the controls. This is comparable with literature stating Drink plenty and don't hold on.

It is also comparable with Mazzola BL et al in which withholding urine, reduced fluid intake, constipation was found to be predisposing UTI in girls aged between 3.8-18 years. Study also suggested that poor genital hygiene and toilet habits were almost always associated with other factors and so not necessarily predispose UTI.[11]

In studies by Loening-Baucke V et al and Koff SA et al constipation and infrequent voiding were found to be risk factors for UTI.[12,13] Cleaning back to front was not demonstrated as a risk factor.

CONCLUSION

The study group in which the risk factors were analysed had a male preponderance and belonged to low socio-economic class. In our study population fever and increased frequency are two important symptoms followed by abdominal pain. Recurrent infection was most often due to unresolved bacteriuria or persistent bacteriuria than reinfection. Signs like supra pubic tenderness and hypertension are very rare. Common organisms causing urinary tract infection in our study population are *E. coli* followed by Klebsiella, proteus and pseudomonas. In this study worm infestation, constipation, voluntary withholding of urine and reduced water intake were found as risk factors for UTI which is similar to other studies.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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