

ESTIMATE THE URINARY TRACT INFECTION (UTI) AMONG THE FEBRILE CHILDREN BETWEEN 5 TO 14 YEARS IN RELATION TO INCIDENCE AND AETIOLOGY

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ABSTRACT

BACKGROUND

Urinary Tract Infection (UTI) is a common bacterial infection in infants and children. The risk of having UTI before age 14 yrs. is approximately 1 to 3% in boys and 3 to 10% in girls. In neonatal period UTI is more common in males and during infancy it is equal in both sexes.

The objectives of the study are- to estimate the incidence of UTI in febrile children between 5 to 14 yrs. age group and also to find out the aetiological agents and their antimicrobial sensitivity pattern.

MATERIALS AND METHODS

All the participants and their parents were interviewed using structured questionnaire for UTI, detailed history. Physical examination with relevant investigations were carried out. Clean catch mid-stream urine collected under aseptic precautions was subjected for microscopic examination and culture. Urine culture samples were transported and processed within an hour in the laboratory. Ultrasonogram of abdomen was done in all the culture positive cases.

Study Design- Prospective Observational Study.

Participants- All children having febrile illness without localising signs and /or having symptoms and signs of urinary tract infection (UTI) of age group 5 to 14 yrs.

RESULTS

Out of total 400 febrile patients, males were 184 (46%) and females were 216 (54%). urine culture was positive in 43 cases (10.75%) with a male to female ratio of 1: 2.9. Increased urinary frequency was an important complaint in majority. Pyuria was present in 128 cases (32%). Urine culture showed 37/43 cases (86%) of *Escherichia coli* (E. Coli), followed by *Enterococcus* 2/43 cases (4.65%), *Citrobacter* 2/43 cases (4.65%), *Klebsiella* in 1/43 case (2.3%) and *Candida* in 1/43 case (2.3%). E. coli was mostly sensitive to Gentamycin, Amikacin followed by nitrofurantoin, Cefixime and least sensitive to Ampicillin. USG abdomen showed some form of abnormality in only 7/43 cases (16.27 %). Phimosi cases were 6.25% (12/184) in total male cases and culture positive was 9% (1/11 cases).

CONCLUSION

All febrile children of unidentified aetiology should be screened for UTI especially in female children. Our study found the incidence of UTI in febrile children is 10.75 %. Most common uropathogen was E. coli and is sensitive to Gentamycin, Amikacin, nitrofurantoin and Cefixime. Urine culture is an important investigation tool for proper diagnosis of UTI in children.

KEYWORDS

Pyuria, Uropathogen, *Escherichia coli*, Phimosi.

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BACKGROUND

Urinary Tract Infection (UTI) is a common bacterial infection in infants and children. The risk of having UTI before age 14 yrs. is approximately 1 to 3% in boys and 3 to 10% in girls.^{1,2} In neonatal period UTI is more common in males and during infancy it is equal in both sexes.

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Thereafter it is more common in girls. The literature estimates that the prevalence of UTI in febrile children presented for outpatient evaluation ranges from 1 to 20%.^{3,4,5}

Children with fever comprise a major chunk of practice in outpatients and emergency visits in the age group of 5 to 14 years. Unlike occult bacteraemia or severe bacterial infection, little attention has been focussed on identification of UTI in these children.

Children with UTI may have a febrile illness and no localising findings. There may be a delay in diagnosis and treatment. Moreover, there is a chance of recurrent infection if inadequately treated. UTI may be missed on history and physical examination if it is not thought of. The strongest

risk factor for UTI are female gender, phimosis in boys, vesico-ureteric reflux and neurogenic bladder.⁶

Adequate treatment of UTI depends on the knowledge of the local pattern of causative pathogens, their antibiotic resistance and the associated risk factors. Appropriate treatment of UTI is the cornerstone of management to prevent the long-term complications related to UTI.

Keeping in view of the above facts, the present study was performed in febrile children of age group 5 to 14 yrs. to determine the incidence, aetiological agents and their sensitivity pattern and also sensitizing the clinician in managing a febrile child.

Aims and Objectives

1. To determine the incidence of UTI in febrile children between 5 to 14 years of age.
2. To find out the etiological agents and their antimicrobial sensitivity pattern in children.
3. Study the clinicopathological profile of UTI in children.

MATERIALS AND METHODS

The present study was conducted in the Department of Paediatrics of M.K.C.G. Medical College and Hospital, Berhampur, Odisha, over a period of 24 months from October 2014 to September 2016.

Study Design- A Hospital based Prospective Observational Study.

Source of Data- Data for the study was collected from OPD and IPD of above mentioned tertiary hospital, after obtaining a written consent from parents and ethical clearance from Institutional Ethical Committee.

Inclusion Criteria- All children having febrile illness without localising signs and / or having symptoms and signs of UTI of age group 5 - 14 yrs. are enrolled for the study.

Exclusion Criteria- Children <5 yrs. and >14 yrs. are excluded and those who received antibiotics 48 hrs prior to evaluation, known diabetes mellitus, having gross congenital genito-urinary abnormalities, severe under nutrition are excluded.

Method of Study- 400 febrile children between 5 – 14 yrs. with suspected UTI were taken for the study from both OPD and IPD. A predesigned proforma was used to collect the information. Children and parents were interviewed using structured questionnaire for UTI. A thorough history and physical examination with relevant investigations were carried out in all patients.

Urine collection was done under aseptic precautions by thorough washing of genitalia with soap and water then clean catch mid-stream urine was collected. After collection, samples were transported and processed within an hour in the laboratory.

Urine samples were centrifuged in a standard manner at the rate of 2500 rpm for 20 to 30 minutes. Supernatant was discarded and the sediment was examined under microscopy for pus cells/ RBCs / crystals / casts / and epithelial cells. In the present study > 5 pus cells per hpf

(high power field) in a centrifuged urine specimen was taken as significant pyuria.⁷

For urine culture, samples received in a sterile container were inoculated into blood agar and MacConkey agar plates with a 0.01 ml calibrated loop. All plates were incubated at 35^o – 37^o Centigrade for 24 hrs under aerobic conditions to obtain accurate colony count. A colony count of >10⁵ / ml of single species were considered significant. Samples showing insignificant growth, mixed growth of two or more pathogens or growth of organism that normally constitute the periurethral flora (lactobacillus) were not considered as culture positive.

Out of 400 cases enrolled, two groups, Group I: 5 - 10 yrs. age and Group II: 10 – 14 yrs. age were created for better understanding of findings.

RESULTS

Out of total 400 cases, males were 184 (46%) and females were 216 (54%). Urine culture was positive in 43 cases (10.75%) and male to female ratio of culture positive cases were 1: 2.9 as shown in Table 1.

Gender	Group I (5 to 10 yrs.)		Group II (10 to 14 yrs.)		Total	Total culture +ve
	Cult. +ve	Cult. -ve	Cult. +ve	Cult. -ve		
Male	7	119	4	54	184 (46%)	11 (5.98%)
Female	26	150	6	34	216 (54%)	32 (14.8%)
Total Culture +ve	33 (76.74%)		10 (23.26%)			43 (10.75%)
Total	302 (75.5 %)		98 (24.5%)		400	

Table 1. Showing Incidence of UTI in different Genders

Symptoms	No. of Patients	% Age
Fever	400	100
Frequency	223	55.75
Nausea and vomiting	187	46.75
Abdominal pain	168	42
Dysuria	112	28
Polyuria	48	12
Haematuria	29	7.25
Dribbling	21	5.25

Table 2. Showing Frequency of Symptoms of UTI in Children

Besides fever, the most common symptom being the frequency of urination followed by nausea and vomiting. 48 patients had previous history of UTI (out of 400 cases)

Urinary Finding	No. of Patients	% Age
Pus cells	128/400	32
Albumin	36/400	9
RBCs	21/400	5.25
Crystals	15/400	3.75
Casts	9/400	2.25

Table 3. Showing Urinary Findings (Out of Total n = 400)

Significant pyuria (Pus cells > 5 / HPF in centrifuged urine) was present in 32 % of cases. The total number of culture +ve cases were 43. The organisms detected in our

study were *Escherichia coli*, *Klebsiella*, *Enterococcus*, *Citrobacter* and *Candida* as shown in table –IV.

Pathogen	Gender				Total
	Male		Female		
	Group I (5- 10 yrs.)	Group II (10 – 14 yrs.)	Group I (5-10 yrs.)	Group II (10- 14 yrs.)	
Escherichia coli	6	4	23	4	37 (86 %)
Klebsiella	0	0	1	0	1 (2.3 %)
Citrobacter	1	0	1	0	2 (4.65 %)
Enterococcus	0	0	1	1	2 (4.65 %)
Candida	0	0	0	1	1 (2.3 %)
Total	11		32		43 (100 %)
Table 4. Showing Pathogens Isolated (n= 43)					

The most common organism isolated was *E. coli* in 37/43 cases (86%).

Antibiotic Sensitivity

Antibiotic	Number	Percentage
Amikacin	32	86.5
Ampicillin	9	24
Cefepime	24	65
Cefixime	28	76
Cefotaxime	29	78.3
Cefuroxime	22	59.45
Ciprofloxacin	13	35.1
Cotrimoxazole	20	54
Gentamycin	35	95
Levofloxacin	16	43.2
Nalidixic acid	29	78.3
Nitrofurantoin	30	81
Piperacillin-tazobactam	25	68

Table 5. Showing Antibiotic Sensitivity of *E. Coli*

In our study *Escherichia coli* (*E. coli*) was highly sensitive to Gentamycin, Amikacin in 95% and 86.5% cases respectively followed by Nitrofurantoin in 81%, Cefixime 76%. It was least sensitive to Ampicillin with 24% sensitivity. Antibiotic sensitivity of other organisms like *Klebsiella* being 100% sensitive to Amikacin, Gentamycin, Cefixime, Cefotaxime, Cefuroxime as shown in table – VI.

Antibiotic	Organisms (% age)		
	<i>Enterococcus</i>	<i>Citrobacter</i>	<i>Klebsiella</i>
Amikacin	50	100	100
Ampicillin	0	0	100
Cefepime	100	0	100
Cefixime	100	50	100
Cefotaxime	100	100	100
Cefuroxime	50	100	100
Ciprofloxacin	0	0	0
Cotrimoxazole	0	0	0
Gentamycin	0	50	100
Levofloxacin	50	0	0
Nalidixic acid	0	0	100
Nitrofurantoin	100	50	0
Piperacillin-tazobactam	0	0	100

Table 6. Antibiotic Sensitivity of other Organisms

Ultrasonogram (USG) abdomen was carried out in 43 culture positive cases, where 7 cases (16.27%) had some finding and rest 36 cases (83.72%) had normal findings. Abnormal findings were increased bladder wall thickness, hydro-ureter, increased cortical thickness and residual urine.

The percentage of phimosis cases were 6.25% (12/184) in total male patients suspected to be UTI and only one case among the 11 culture +ve male patients (9%) had phimosis.

DISCUSSION

The observed incidence rate of UTI in our study is 10.75% out of total 400 febrile children enrolled. With a female preponderance of 14.81% and males constituting 5.98% which corresponds approximately to many studies done prior.^{8,9}

Majority of culture positive UTI cases were from 5-10 yrs. group.

As the symptoms and signs of UTI are sometimes non-specific like nausea, vomiting and abdominal pain, it should be suspected and evaluated in every child presenting with unexplained fever.¹⁰

Though pyuria was a common finding in our study, 128 cases (32%) but culture positive cases came out to be 43 (10.75%).

E. coli was the most common urinary pathogen isolated in both age groups, accounting to 86% of total isolates. Which is in accordance to many previous studies.^{11,12,13,14}

E. coli was sensitive to Gentamycin, Amikacin, Nitrofurantoin, Nalidixic acid, Cefotaxime, Cefixime, piperacillin-tazobactam, Cefepime, Cotrimoxazole, Levofloxacin, Ciprofloxacin and least sensitive to Ampicillin.¹⁵

Various studies demonstrating high sensitivity of *E. coli* to Nitrofurantoin (97.2 %) and Amikacin (92 %) by Amit A R et al (2015).¹⁶

Another study by Nirmaljit K et al (2014)¹⁷ suggesting high sensitivity of *E. coli* to Nitrofurantoin (95%), piperacillin – tazobactam (95%) and Cotrimoxazole (25%). Our study is well correlated to the above studies.

Other organisms isolated were *Klebsiella*, *Enterococcus*, and *Citrobacter*. *Klebsiella* being highly sensitive to Amikacin, Cefixime, Cefuroxime, Cefotaxime, Ampicillin and resistant to Cotrimoxazole, Nitrofurantoin. *Enterococcus* was highly sensitive to Cefepime, Cefixime, Cefotaxime, and

Nitrofurantoin, which is well correlated to the other studies done earlier.^{16,15}

USG abdomen was done in all the 43 culture +ve cases; majority had normal USG.^{18,19} Some form of abnormal ultrasonogram findings were present in 16.27% cases. In our study, USG could not delineate any VUR (Vesico Ureteral Reflux) cases, and moreover none of our cases were subjected for MCUG (Micturating Cysto-urethrogram), which could have detected the VUR cases.

Phimosis was present in 6.25% male cases of suspected UTI, but culture +ve was in only one case.

CONCLUSION

Urinary tract infection remains a common and significant cause of concern in paediatric age group because of high morbidity, nonspecific presentation and therapeutic inadequacy. Diagnosing and treating these infections promptly is of paramount importance for the clinicians. The overall incidence of UTI is 10.75% and based on the findings of this study, it is concluded that acute uncomplicated UTIs are more prevalent in females. Our study confirmed *Escherichia coli* to be a major uropathogen and the isolated *E. coli* is highly sensitive to Gentamycin, Amikacin, Cefixime, and Nitrofurantoin. The study further detected that commonly prescribed antibiotics Cotrimoxazole and Ampicillin are rather ineffective. In all cases of fever of unexplained origin with or without urinary symptoms, proper urine examination including the culture is very important to diagnose UTI. Before starting the empirical antibiotics, clean catch mid-stream urine for culture remains an important investigation tool. Due importance should be given to urinary symptoms and especially phimosis in male children. In all the culture positive cases, full course of therapy and ultrasonogram examination is a must, to prevent long term complications and proper management. Sensitivity of an uropathogen to a particular antibiotic varies from time to time and across different areas. To reduce the incidence of resistance, empirical antibiotic selection in treatment of UTI must be based on the knowledge of local prevalence of causative pathogens and their respective antimicrobial sensitivity rather than on universal guidelines.

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