

Original Research Article

A retrospective study on prevalence, bacteriological profile and antibiotic sensitivity pattern of urinary tract Infection in children of 2-12 years age in a tertiary care centre, Puducherry, India

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ABSTRACT

Background: Urinary tract infections (UTIs) are a common cause of acute bacterial illness in infants and children(1).Diagnosis is often missed in infants and children as urinary symptoms are minimal and nonspecific. It is becoming increasingly difficult to treat due to increasing prevalence of antimicrobial resistance among organisms.

Method: It was done as a retrospective cross sectional study conducted on Children of 2-12 years of age suspected to have UTI from January 2018 to December 2018 in Pediatric Department of AVMCH.

Results: Out of 286 children with symptoms suggestive of Urinary tract infection, 22(7.7%) were found to have culture positive UTI with 9.2% prevalence in 2-6 years age group as against 6.4% in 7-12 years of age group. Culture positive UTI was predominantly found in males in 2-6 years age group as against female predominance in 7-12 years age group. *E. coli* (45.5%) was the commonest organism isolated among them followed by *Klebsiella*. 90% of organisms were sensitive to Nitrofurantoin and 80% were sensitive to Amikacin(80%).

Discussion: Culture positive UTI rate varies with gender and age group. It was predominantly found in males in 2-6 years age group as against female predominance in 7-12 years age group. *E. coli* and *Klebsiella* were the most common organisms with predominant sensitivity to Nitrofurantoin and Amikacin similar to other studies. Limitation of this study Retrospective study, small sample size and follow up for complications not done.

Conclusion: This study concludes *E. coli* and *Klebsiella* were the most common organisms with predominant sensitivity to Nitrofurantoin and Amikacin. Antibiotics need to be selected based on organisms and their sensitivity pattern.

Keywords: Antibiotic sensitivity, Prevalence, Urinary tract infection

INTRODUCTION

Urinary tract infections (UTIs) are a common cause of acute bacterial illness in infants and children.¹ Urinary Tract Infection is defined as the microbial invasion of any of the tissue of the urinary tract extending from the renal cortex to the urethral meatus. Urine formed in the kidney is a sterile fluid that serves as a good culture medium for proliferation of bacteria.² The diagnosis of UTI is often missed in infants and children, as urinary symptoms are

minimal and nonspecific. Timely diagnosis and adequate, appropriate antibiotic treatment is necessary to prevent renal damage in the form of renal scarring, hypertension and subsequent renal parenchymal damage. It is an important cause of fever without focus in children and presents as a part of septicemia with fever, vomiting, lethargy, Jaundice and seizures. Older children are able to verbalize better specific symptoms, such as dysuria, frequency, urgency, new onset urinary incontinence,

abdominal or flank pain, suprapubic discomfort, and vomiting.

Acute UTIs are relatively common in children. By seven years of age, 8 percent of girls and 2 percent of boys will have at least one episode. After preliminary cleaning of the genitalia, clean catch mid-stream urine should be collected by caregiver and subjected for laboratory analysis. Diagnosis of urinary tract infection is by growth of a significant number of organisms of a single species in the urine, in the presence of symptoms.³ Combination of clinical symptoms, pyuria and positive urine culture with >50,000 CFU/ml of a single pathogenic organism on an appropriately collected urine culture.⁴ The reference standard for the diagnosis of UTI is a single organism cultured from a specimen obtained at the following concentrations: supra pubic aspiration specimen-greater than 1,000 colony-forming units per ml; catheter specimen- greater than 10,000 colony-forming units per ml; or midstream clean-catchspecimen-100,000 colony-forming units per ml or greater.⁵ In older children, sample for urinalysis and urine culture can be collected from suprapubic aspiration or urethral catheterization when the child is ill and require immediate antibiotic therapy.

Common uropathogens include *Escherichia coli* (accounting for approximately 85 percent of UTIs in children), *Klebsiella*, *Proteus*, *Enterobacter*, *Citrobacter*, *Staphylococcus saprophyticus*, and *Enterococcus*.⁶ Biochemical analyses of leukocyte esterase and nitrite through a rapid dipstick method and urine microscopic examination for pyuria and bacteriuria are carried out. The combination of both leukocyte esterase and nitrite tests is highly sensitive and specific. Recent study shows dipstick may be an adequate screening test for UTI with a negative predictive value of 98.7%. As it is standard procedure, adding microscopy increases the negative predictive value to 99.2% but results in 8 false-positive tests for every UTI missed by dipstick.^{7,8}

Objective of this study was to prevalence of culture positive urinary tract infection in children of 2-12 years age and its bacteriological profile with antibiotic sensitivity pattern over one year period.

METHODS

This retrospective cross sectional study was done after Institutional Ethical committee clearance in 286 children of 2-12 years age group with suspected UTI infection who attended Paediatric OPD and admitted in wards of AVMC and H from January 2018 to December 2018. A brief clinical history obtained from each patient and their parents' to find out if there was any risk factor predisposing to UTI. After cleaning genitalia with water, mid-stream clean catch urine was collected and subjected for laboratory analysis. Urine samples were examined and processed in the laboratory as soon as possible after collection.

Microscopy

Urine specimens examined by wet mounts and gram staining. Presence of any pus cells, microorganisms, RBC's, cast and crystals or any other findings noted. Organisms grown in urinary culture growth were identified by relevant biochemical reactions.

Culture

Urine specimen was plated on blood agar and MacConkey agar. After 24 hours of incubation, culture plates were observed for growth and bacterial species identified. Antibiotic sensitivity testing. In the presence of any potential growth, antibiotic sensitivity testing were done by the modified Kirby-Bauer disc diffusion method according to the Clinical and Laboratory Standards Institute (CLSI) guidelines. The antibiotics tested were Nitrofurantoin, Amikacin, Ciprofloxacin, Cotrimoxazole, Amoxicillin Clavulanate, Piperacillin, Linezolid, Nalidixic Acid, Streptomycin and Gentamicin.

Analysis

Data were collected and entered in Microsoft excel 2010. It was analysed using frequency distribution in number and percentage.

RESULTS

Overall 7.7% of children with suspected UTI had culture positive sepsis with more prevalence (9.2%) among 2-6 years age as compared to 7-12 years age.54.5% were males as against 45.5% of females in our study. 2 to 6 years age group had higher prevalence (9.2%) of culture positive UTI as against only 6.4% in 7 to 12 years age group. Prevalence of Culture positive UTI in the 2 to 6 years age group were 10.8% and 7.1% in males and females respectively. In the age group 7 to 12 years, Prevalence of culture positive UTI were 5.9% and 6.9% in males and females respectively. Culture positive UTI was predominantly found in males in 2-6 years age group as against female predominance in 7-12 years age group. (Table 1).

E. coli (45.5%) was the commonest organism isolated among them in our study followed by *Klebsiella* which is 18.1%. 2.8% among the suspected UTI had mixed growth of organisms and hence discarded from the analysis (Table 2). *E. coli* had sex predilection of male in 2-6 years age as compared Female predilection in 7-12 years age group (Table 3). Only females in 2-6 years age group had been affected with *Klebsiella* urinary tract infections as against no sex predilection in 7-12 years age group (Table 4). All *E. coli* were susceptible to Nitrofurantoin and Amikacin but developing resistance to other antibiotics. (Figure 3). All *Klebsiella* were sensitive to Nitrofurantoin and all of them were resistant for Amoxicillin-clavulanate, Ciprofloxacin and Carbapenem

(Figure 4). 90% of organisms were sensitive to Nitrofurantoin followed by Amikacin (80%) (Table 5).

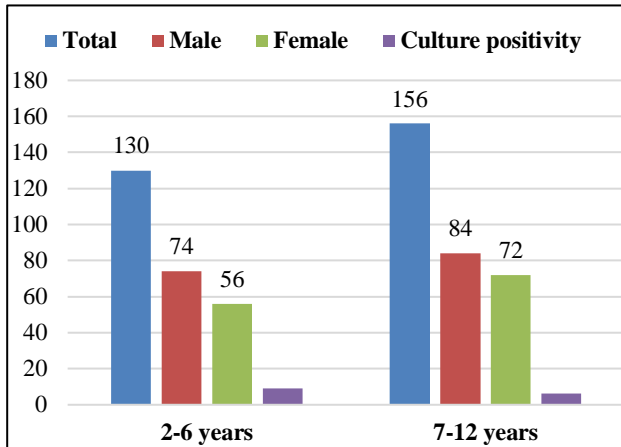


Figure 1: Age and Sex distribution in relation to positive urine culture.

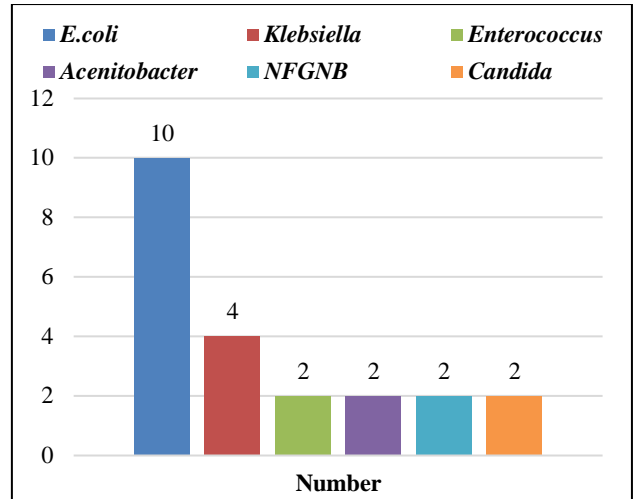


Figure 2: Bacteriological profile of urinary tract infections.

Table 1: Age and sex distribution in relation to positive urine culture.

Age Group	Total no. of patients	Male	Female	Total positive culture	Positive culture males	Positive culture females
2 to 6 Years	130(48.9%)	74	56	12(9.2%)	8(10.8%)	4(7.1%)
7 to 12 Years	156 (51.1%)	84	72	10(6.4%)	5(5.9%)	5(6.9%)

Table 2: Bacteriological profile of urinary tract infections.

<i>E. coli</i>	<i>Klebsiella</i>	<i>Enterococci</i>	<i>Acinetobacter</i>	Non Fermenting Gram Negative Bacteria	<i>Candida</i>
10 (45.5%)	4(18.1%)	2(9.1%)	2 (9.1%)	2 (9.1%)	2 (9.1%)

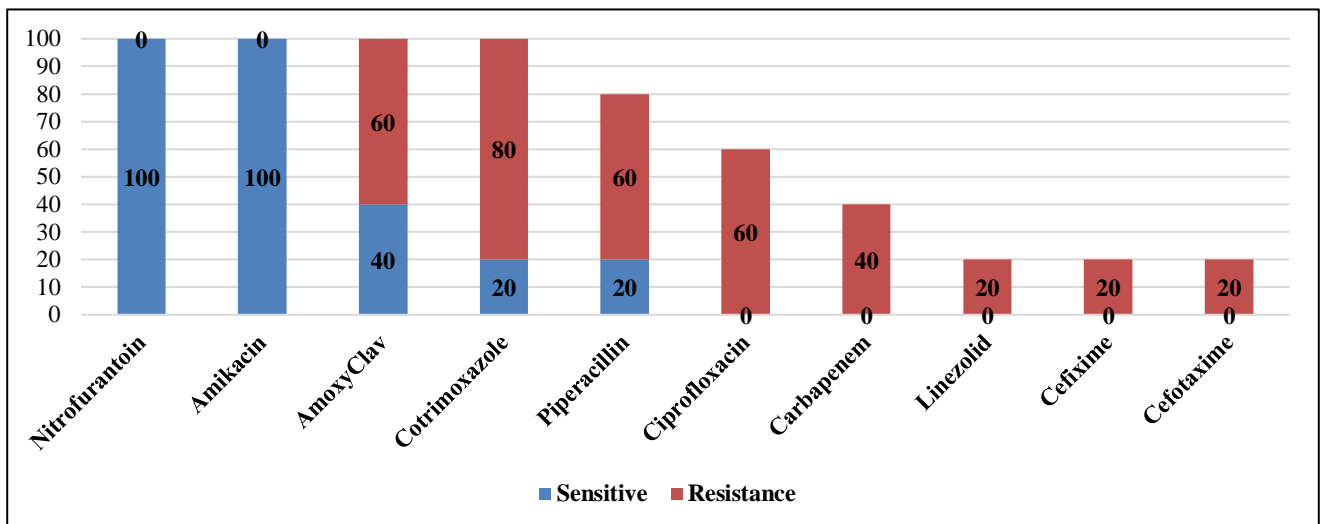


Figure 3: Antibiotic sensitivity pattern among E. coli sepsis.

Table 3: Sensitivity pattern of E. coli according to age group.

Age Group	Male	Female
2 to 6 Years	5(50%)	1(10%)

Table 4: Sensitivity pattern of Klebsiella according to age group.

Age Group	Male	Female
2 to 6 Years	0(0%)	2(50%)
7 to 12 Years	1(25%)	1(25%)

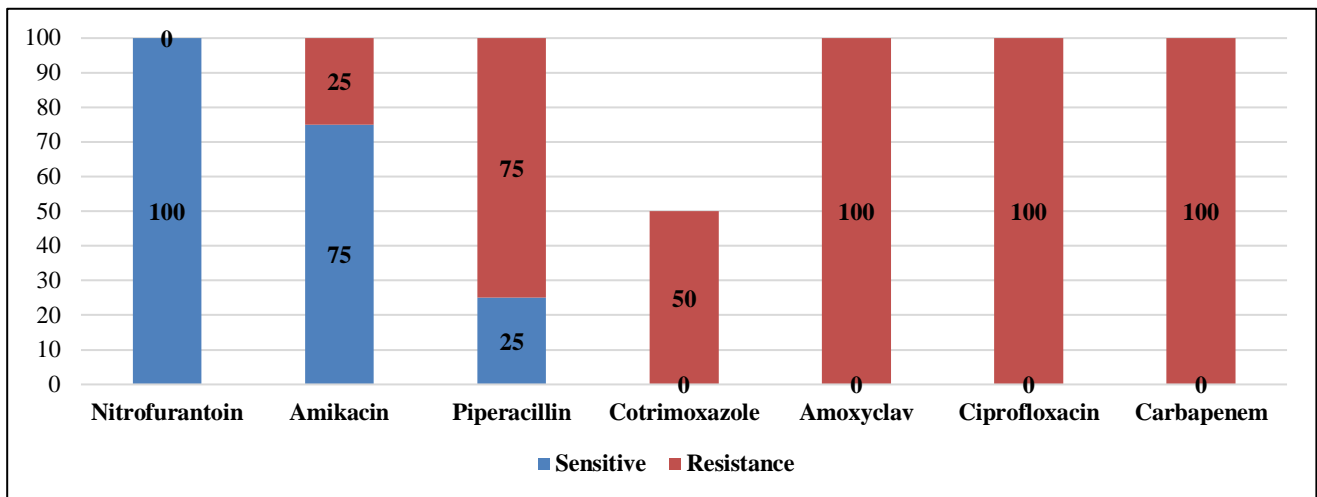


Figure 4: Antibiotics susceptibility pattern among *Klebsiella*.

Table 5: Overall antibiotic sensitivity pattern of all organisms together.

S. no.	Antibiotics	Percentage sensitive
1	Nitrofurantoin	90%
2	Amikacin	80%
3	Ciprofloxacin	25%
4	Cotrimoxazole	20%
5	Amoxycillin Clavulanate	20%
6	Piperacillin	15%
7	Linezolid	10%
8	Nalidixic Acid	10%
9	High Level Gentamicin	5%
10	Streptomycin	5%

DISCUSSION

Prevalence of culture proven UTI was 7.7% in our study which was much lower than Palak et al and Iranian study in which 35.4% and 34.2% of suspected UTI children had Culture proven UTI respectively.⁹⁻¹⁰ Culture positive rate was 15.7%,26.8% and 18.3%in other studies by Kaur, Thaddene and Patwardhan respectively.¹¹⁻¹³ This wide difference may be due to infant being the major contributor of culture positive UTI in Kaur study and we have taken only from 2-12 years age group. Males were predominant in our study in both age groups which may explain gender preference of health seeking behaviour. In age group of 2-6 years males and in 7-12 years females predominantly had prevalence was of culture positive UTI similar to other studies. In the age group of 2 to 6 years the prevalence is 9.2% and 6.4% were in the age group of 7 to 12 years which may be due to improvement in their immunity and personal hygiene which could be contributing to lower prevalence in 7-12 years age group.

Prevalence of Culture positive UTI in the 2 to 6 years age group were 10.8% and 7.1% in males and females respectively similar to Taneja study of higher prevalence in males.¹⁴ In the age group 7 to 12 years, Prevalence of culture positive UTI were 5.9% and 6.9% in males and females respectively. Culture positive UTI was predominantly found in males in 2-6 years age group as against female predominance in 7-12 years age group. *E. coli* (45.5%) was the commonest organism isolated among them in our study similar to Kaur et al of 45.4% and Kulkarni study.¹⁵ Next most common organism isolated is *Klebsiella* which is 18.1% in our study versus 16.1% in Kaur study.¹¹ In Iranian study, *E.coli* was isolated in 57.4% among the culture positivity.⁹ 90% of organisms were sensitive to Nitrofurantoin as against 51.8% in Iranian study, 60% in Patwardhan study and 75.8% in a systematic review by Ashley.^{12,16} Sensitivity of amikacin in this study was 80% as against Mashouf study of 93.9%.These antibiotics resistance pattern can persist for 6 months after treatment. Hence oral nitrofurantoin can be started which would be cheap, sensitive antibiotics and reduce direct and indirect cost of hospitalization.

Retrospective study, small sample size and follow up for complications not done; were the limitations of this study.

CONCLUSION

The optimal diagnosis of UTI in children should be based on clinical presentation, physical examination, urinalysis interpretation, methods of urine collection, cut off threshold of urine culture, inflammatory markers, and sometimes imaging studies. Timely and appropriate diagnosis and prompt treatment of UTI is important to eradicate acute infection, prevent bacteremia, improve

clinical condition and reduce the likelihood of renal damage. *E. coli* and *Klebsiella* were the most common organisms with predominant sensitivity to Nitrofurantoin and Amikacin in our study. Empirical Antibiotics need to be selected based on organisms and their sensitivity pattern in that region.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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