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Research paper

Cystitis in pediatric age group and its empirical therapy in a coastal region of southern India

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Abstract

Cystitis in childhood, is a common health issue causing morbidity and mortality. This study was to find out the bacterial pathogens causing cystitis in children and its susceptibility pattern. 1792 urine specimens from 1day- 18 years of age suspected of cystitis were obtained. Samples were inoculated into culture plates. Identification of the pathogens was by MALDI-ToF mass spectrometry and antimicrobial susceptibility testing by VITEX 2 system (bioMerieux,Inc, Durham, NC). 48.38% were males and 51.61% were females, 65% attended outpatient department and 35% were admitted in the hospital. Cystitis was more frequently seen in less than one year. Samples when on inoculation into the culture plates, had no organisms in 69.31% and 30.69% had significant bacteriuria. Bacteriuria among boys was more frequently seen in the age group of less than one year of age (35.06%) in the females, bacteriuria was more commonly seen in the age group of 1-5 years (28.32%). Escherichia coli 63.45% was the commonest pathogen isolated. Susceptibility to Trimethoprim/sulphamethoxazole was 84.53% and Ampicillin 45.56% .Since Trimethoprim/sulphamethoxazole is an FDA approved and cost effective drug, it could be an empirical drug of choice for treating cystitis in children of more than 6 weeks of age in the developing countries.

Keywords: *Antibiotic; Bacteriuria; Cystitis; E Coli; Trimethoprim/ Sulphamethoxazole.*

1. Introduction

Urinary tract infection (UTI) or cystitis during childhood is one of the common problem seen in the health care settings and is recognised as an important cause of morbidity and death during the first two years of childhood [1-3]. The incidence of UTI is reported in 7% of the girls and 2% of the boys during the first 6 years of childhood [4]. Urinary tract infection (UTI) is identified by the presence of both pyuria and with at least 50,000 colonies/mL of a single type of uropathogenic bacteria in an appropriately collected specimen of urine [5]. UTI is more common during neonatal period and in early infancy and it declines afterwards in male children. Among infant girls, UTI is seen in 0.1–0.4% and increase up to 1.4% during 1–5 years and 0.7–2.3% in the school going age [6]. Prompt diagnosis and treatment with antimicrobials is essential to minimize the complications of cystitis. Usually 48 hours is required for reporting of antimicrobial susceptibility testing of the urinary tract infection after collecting the urine sample, therefore treatment decision is usually empirical in most of the uncomplicated cystitis cases. Since the initiation of antimicrobial treatment to patients with cystitis is empirical, knowledge of the resistance pattern of common pathogens causing UTI in each locality against the antimicrobials is essential to provide appropriate treatment [7] Cost effective management is also important. Hence, the present study was conducted to find out the bacterial pathogens involved in causing cystitis and its antimicrobial resistance at a tertiary care hospital.

2. Materials and methods

Institutional research committee approval was taken for the study. A total of 1792 non-repetitive specimens of urine collected for one year from pediatric patients (0–18 years in different age groups) suspected of UTI were obtained in the Microbiology laboratory located in a Coastal region of South India. Urine samples were collected from patients attending as outpatients at a tertiary care hospital and also from inpatients. Gender and age of the paediatric patients were noted. Midstream urine samples, collected from them were inoculated into culture plates using a standard calibrated wire loop. The technique used was a semi quantitative technique following Kass's concept. Streaking method was four quadrant streaking without intermittent heating, culture plates used were blood agar and MacConkey agar. Culture plates with growth of $\geq 10^5$ colony forming unit per milliliter of the urine sample was considered significant. Identification of the bacteria was done by using Matrix Assisted Laser Desorption Ionization – Time of Flight (MALDI-TOF) (Biomerio, ElToile, France) and for antibacterial susceptibility testing was done using Vitex automated system (Biomerio, ElToile, France).

3. Results

A total of 1792 urine samples were received during the study period, out of which, 867 (48.38%) were from male children and 925 (51.61%) from female children. 1165 children were attending out-patient department 65% and remaining 627 (35%) children were admitted in the hospital. Distribution of samples according to age group showed, that majority of samples were from the age group of children less than one year 528(30.18%) followed by the age group of one to five years 520 (29.73%). Least number of urine samples were in the age group of sixteen to eighteen years, 205 (11.72%). Highest number of male children were in the age group of less than one year 304 (35.06%) and highest number of female children were in the age group of 1-5 years 262 (28.32%) (Fig 1).

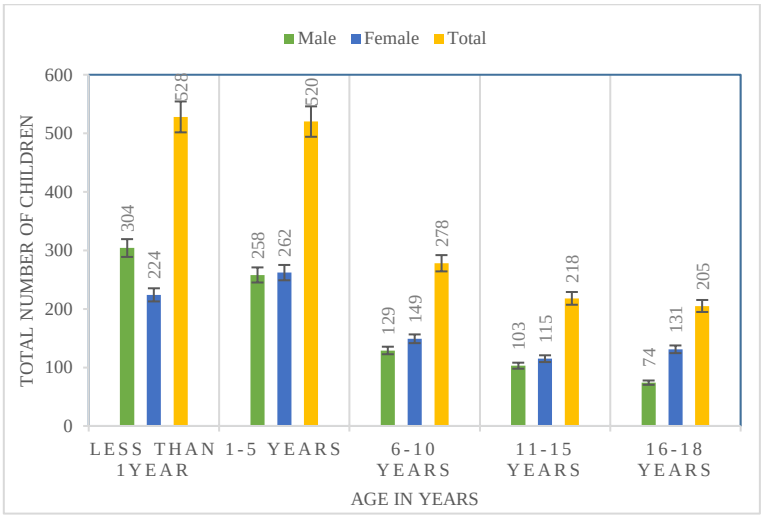

Fig. 1: Age Wise Distribution of Urine Samples Collected.

Out of the total of 1792 urine samples, 550 (30.69%) samples had significant growth in the culture plates and 1199 (66.90%) samples had no growth in the culture plates. Among the organisms isolated, E coli was the commonest organism 349 (63.45%) followed by Klebsiella species 90 (16.36%) (Fig 2).

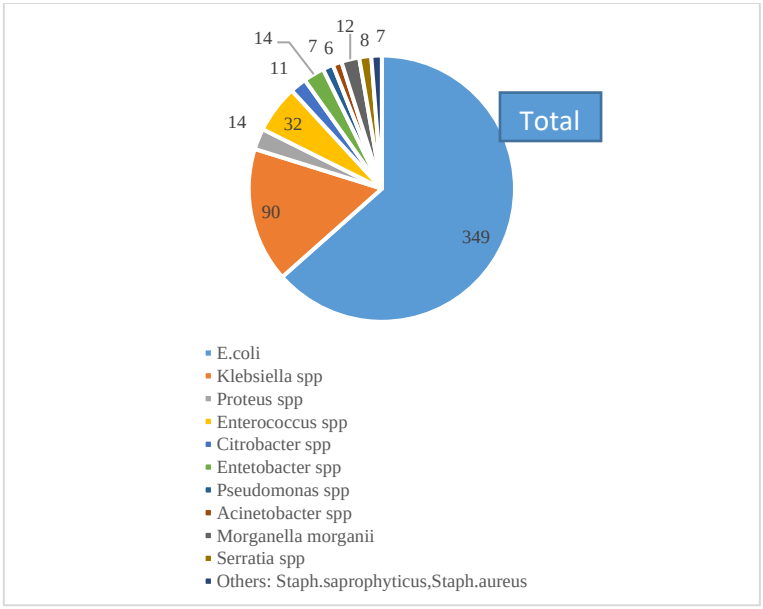

Fig. 2: Number of Strains of Bacteria Isolated from UTI.

Antibiotic susceptibility pattern showed that E coli was susceptible to Trimethoprim/sulfamethoxazole 295 (84.53%), ampicillin 159 (45.56 %), amoxicillin-clavulanic acid 169 (48.43%), gentamicin 279 (80%), amikacin 294 (84.25%) and meropenem 335 (96%) ceftriaxone 169 (48.43%), cefuroxime 169 (48.43%), norfloxacin 299 (85.68%), cefoperazone-sulbactam 339 (94.27%), piperacillin-tazobactum 327 (93.7%) (Fig 3).

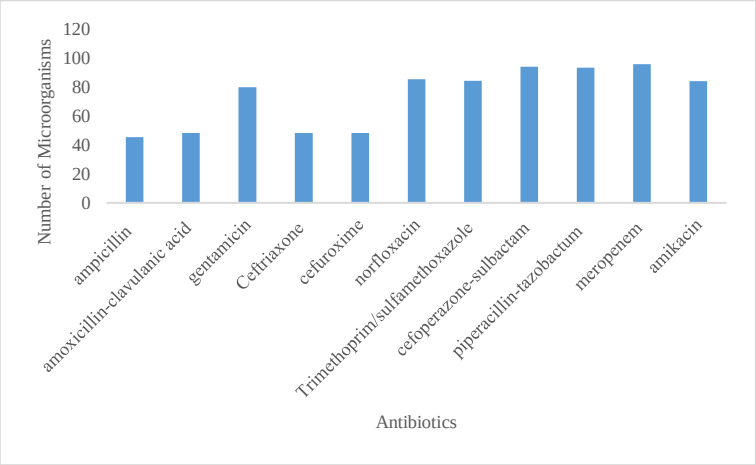

Fig. 3: Antibiotic Susceptibility Pattern of Uropathogenic E Coli.

Klebsiella pneumoniae was susceptible to Trimethoprim/sulfamethoxazole 75 (83%), ampicillin 57(63.34%).amoxicillin-clavulanic acid 59(65.56%), gentamicin 61 (67.78%), amikacin 72 (80%) and meropenem 86 (95.56%)
In the gram positive coccus group, maximum number of organisms isolated was enterococcus, 32 strains. All the strains were susceptible to Benzyl penicillin, high level gentamicin, Trimethoprim/sulfamethoxazole and nitrofurantoin.
Discussion:
Our study showed that more number of female children (51.61%) suffered from cystitis without complications than male children (48.38%). A study conducted by Seyed Reza Mirsoleymani et al [6] showed that more number of males
(54.9%) suffered from cystitis than females (45.1%). Study conducted by Elder JS et al [7] showed that more number of girls (3-5 %) suffered from cystitis than boys (1%), similar findings was also reported by Hillary L Copp et al[8] 2% boys and 7% girls suffered from UTI.
Out of the total of 1792 urine samples collected, 550 (30.69%) samples had significant growth in the culture plates and 1199 (66.90%) samples had no growth in the culture plates. Study conducted by Gupta P et al [9] found 35.4% were culture positive which opined the same as our study. Among the organisms isolated from culture, E coli was the commonest organism causing cystitis in children (63.45%) followed by Klebsiella species (16.36%) and enterococcus species 32 (35.55%) , Christopher D Doern et al [10], Alexander KC Leung et al [11] in their study on cystitis in children had E.coli as the commonest organism followed by Klebsiella species causing cystitis. Our study was in concordance with these study. A Study conducted by Hillary L. Copp et al [8] had E coli as the commonest organism followed by Enterococcus and Klebsiella species.
Antibiotic susceptibility pattern showed that E coli was sensitive to Trimethoprim/sulfamethoxazole 295 (84.53%), ampicillin 159 (45.56 %), amoxicillin-clavulanic acid 169 (48.43%), amikacin294 (84.25%) and meropenem 335 (96%) .Likewise Klebsiella pneumoniae was susceptible to Trimethoprim/sulfamethoxazole 75 (83%) ,ampicillin 57(63.34%).amoxicillin-clavulanic acid 59(65.56%), gentamicin 61 (67.78%), amikacin 72 (80%) and meropenem 86 (95.56%) .Similar studies conducted by Eun Young Seo et al [12] showed E coli resistant to ampicillin was 55.5% , Klebsiella pneumoniae resistant to ampicillin was 77.8%. Study conducted by Duployez C et al [13] had Ecoli susceptibility to Trimethoprim/sulfamethoxazole of 78%. Wesolek JL et al [14] in their study had 74.9% sensitivity to Trimethoprim/sulfamethoxazole. Since the susceptibility of uropathogens to Trimethoprim/sulfamethoxazole is high and is cost effective when compared to other antibiotics and it can also be administered orally without regards to meals [15], and only barring those children with risk factors[16], Trimethoprim/sulfamethoxazole can still be considered as an empiric drug of choice especially in the developing countries in paediatric age group for acute uncomplicated cystitis.

4. Conclusion

Since cystitis in children is a common problem, more commonly seen even in children of less than one year of age in both genders, Trimethoprim/sulfamethoxazole can be considered as an empiric drug of choice to infants and children who are more than 6 weeks old for acute uncomplicated cystitis since it is a cost effective drug .Further clinical and epidemiological study is needed to optimise the paediatric antimicrobial stewardship strategies in this coastal region.

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