RESEARCH ARTICLE

Bacteriology of Urinary Tract Infection and Antibiotic Susceptibility Pattern in a Tertiary Care Hospital in South India

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ABSTRACT

Background: Urinary tract infection is one of the most common bacterial infections seen in clinical practice particularly in developing countries. The causative agents for Urinary tract infection vary from place to place and they also vary in their susceptibility and resistance patterns.

Objective: Studies to know the most common causative agents and their susceptibility pattern will help the clinicians to choose the antibiotic for empirical treatment. This study was done to find out the common bacteria causing UTI and to determine the antibiotic susceptibility pattern of the urinary pathogens from a tertiary care hospital in South India.

Materials and Methods: A total of 573 mid-stream urine samples from the suspected UTI patients were tested microbiologically and antimicrobial susceptibility test were performed for the isolated pathogens using Kirby-Bauer disk diffusion method.

Results: The rate of culture positivity in females was 87.82% and in males was 27.92%. E-coli was the most frequently isolated urinary pathogen (37.95%), followed by Klebsiella(21.41%) and Acinetobacter(10.94%). E-coli was highly sensitive to Nitrofurantoin(81.92%) and Amikacin(69.88%) and it was highly resistant to Ampicillin(1.0%). Klebsiella was highly sensitive to Impinem and it was highly resistant to Ampicillin.

Conclusion: Higher prevalence of UTI was seen in females. Gram negative organisms were the most commonly isolated organisms in UTI. Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid. The susceptibility and resistance patterns of urinary pathogens should be considered before starting empirical treatment for UTI.

Key Words: Urinary Tract Infection; Antimicrobial Susceptibility; Urinary Pathogens

INTRODUCTION

Urinary tract infections are the most common infections in clinical practice.[1] Urinary tract infection (UTI) is one of the most important causes of morbidity in the general population, and is the second most common cause of hospital visits.[2] It has been estimated that globally symptomatic UTIs result in as many as 7 million visits to outpatient clinics, 1 million visits to emergency departments, and 100,000 hospitalizations annually.[3] The most common pathogenic organisms of UTI are Escherichia coli, Staphylococcus saprophyticus and less common organisms are Proteus sp., Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococci and Candida albicans.[4] Treatment of UTI cases is often started empirically and therapy is based on information determined from the antimicrobial resistance pattern of the urinary pathogens.[3] In spite of the availability and use of the antimicrobial drugs, UTIs caused by bacteria have been showing increasing trends

in recent years. Much of the increase has been related to emerging antibiotic resistance in urinary tract pathogens.[5] The prevalence of antimicrobial resistance in urinary pathogens is increasing worldwide. Accurate bacteriologic records of culture results may provide guidance on empirical therapy before sensitivity patterns are available.[6]

This study was done to find out the common bacteria causing UTI and to determine the antibiotic susceptibility pattern of the urinary pathogens. We report the Prevalence and antibiotic susceptibility pattern of urinary pathogens causing urinary tract infections (UTI) over one year period from a tertiary care hospital in South India.

METHODS

The study was done from January 2011 to December 2011 at the Department of Microbiology, J.J.M. Medical College, Davanagere, Karnataka, India. Mid-stream urine samples from the suspected UTI patients referred by physicians of Chigateri government District Hospital and Bapuji Hospital, both attached to J.J.M. Medical College were collected in sterilized containers. The name, age, sex and address of the patients was also recorded. The collected urine samples were inoculated on CLED (cysteine lactose electrolyte deficient agar) agar plates and cultured media were incubated aerobically at 37°C. The urine culture plates were examined for pure growth determined by morphologically same type of colonies and colony counts for determination of significant and insignificant growth. A growth of $\geq 10^5$ colony forming units/ml was considered as significant bacteriuria. [7] Gram staining was performed to differentiate the Gram positive and Gram negative organisms. Antimicrobial sensitivity of the confirmed micro-organisms was done by disc diffusion method on Muler Hinton agar. Antibiotic susceptibility tests and interpretations were carried out for bacterial isolates by the Kirby-Bauer technique. [8] The antibiotics tested were Nitrofurantoin, Amikacin, Cotrimoxazole, Gentamycin,

Ciprofloxacin, Cefoxitim, Nalidixic acid, Norfloxacin, Ampicillin and Impinem.

Data Analysis

Statistical package for social sciences "SPSS-15.0"was used for data analysis. The results were presented in terms of frequencies and percentages.

RESULTS

A total of 573 samples were collected in the study period of which 419(73.12%) were from females and rest 154(26.88%) samples were from males. Pathogenic bacteria were isolated in 411 samples with a prevalence rate of 71.72%. The prevalence in females was 87.82% and the prevalence rate in males was 27.92%, the prevalence pattern in males and females is shown in table 1.

Table-1: Sex wise Distribution of Prevalence of Urinary Tract Infection

Sex	No. of Samples Investigated	No. of Positive Samples	Prevalence (%)
Male	154	43	27.92%
Female	419	368	87.82%

UTI was most commonly seen in the age group of 21-40 years as 54.98% of samples were in this age group. The age wise distribution of the samples and their positivity is shown in table 2. Among females UTI was commonly seen in the age group of 21-40 years and in males it was common between 41-60 years.

E-coli was the most frequently isolated urinary pathogen (37.95%), followed by Klebsiella (21.41%) and Acinetobacter (10.94%). The isolation rates of other organisms are shown in table 3.

E-coli was highly sensitive to Nitrofurantoin and Amikacin and it was highly resistant to Ampicillin and Nalidixic acid. Klebsiella and Acinitobacter were highly sensitive to Impinem and Amikacin respectively. The sensitivity pattern to other antibiotics is shown in table 4.

Table-2: Age Wise Distribution of Prevalence of Urinary Tract Infection

Age (Year)	Total No. of Samples	No. of Positive Samples		
		Male	Female	Total
<20	152 (26.52%)	13 (30.23%)	89 (24.18%)	102 (24.81%)
21-40	282 (49.21%)	5 (11.62%)	221 (60.05%)	226 (54.98%)
41-60	76 (13.26%)	4 (9.30%)	25 (6.79%)	47 (11.43%)
61-80	43 (7.50%)	20 (46.51%)	24 (6.52%)	26 (6.32%)
>80	20 (3.49%)	1 (2.32%)	9 (2.44%)	10 (2.43%)
Total	573 (100%)	43 (100%)	368 (100%)	411 (100%)

Table-3: Frequency of Isolation of Various Urinary Pathogens

Urinary Pathogen Isolated	Number
E. coli	156 (37.95%)
Klebsiella	88 (21.41%)
Acinetobacter	45(10.94%)
Candida	32 (7.70%)
Enterobacter	30 (7.29%)
Cons	23 (5.59%)
Staph. aureus	18 (4.38%)
Pseudomonas	13(3.16%)
Proteus	6(1.46%)

Table-4: Percentage of In Vitro Antibiotic Sensitive Pattern of Most Frequently Isolated Microorganisms

Drugs	E. coli	Klebsiella	Acinetobacter
Nitrofurantoin	**81.92**	20.40	20.00
Amikacin	69.88	36.73	**48.00**
Cotrimoxazole	31.32	22.40	28.00
Gentamycin	26.50	16.32	28.00
Ciprofloxacin	10.84	30.62	40.00
Cefoxitin	10.84	14.28	24.00
Nalidixic acid	2.41	18.36	16.00
Norfloxacin	6.02	30.61	16.00
Ampicillin	1.0	12.24	12.00
Imipenam	36.80	**38.77**	12.00

DISCUSSION

Effective management of patients suffering from bacterial UTIs commonly relays on the identification of the type of organisms that caused the disease and the selection of an effective antibiotic agent to the organism. Diagnosis of UTI is a good example of the need for close cooperation between the clinician and the microbiologist.[9] In our study the prevalence rate of isolation of urinary pathogen was 71.72%. In a similar study by Das RN etal isolation rate was 71.6%.[10]

Prevalence of UTIs was more in females when compared to males. This was in agreement with other studies by Bashir MF etal.[11] and Getenet B. etal[12] Women are more prone to UTIs than men because, in females, the urethra is much shorter and closer to the anus.[13]

Higher proportions of patients were in the age group between 20-40 years followed by < 20 years age group. This was in consistent with a study by Beyene G et al 12 in which 53.5% were in the age group between 19-39 years.

Among patients with UTI, females were most commonly in the age group between 21-40 years and males were between 61-80 years. This was in consistent with a study by Susan AMK [14] who concluded that most uncomplicated urinary tract infections occur in women who are sexually active, with far fewer cases occurring in older women, those who are pregnant, and in men. The incidence of UTI increases in males as the age advances because probably because of prostate enlargement and other related problems of old age.

E-coli was the most common isolated organism in our study. This was in seen in other studies by Gupta et al[15], Moges et al[16] , Sibi et al[17]. The second most common isolated pathogen was Klebsiella in our study accounting for 21.41%. This was in agreement by Khameneh et al[18] and Chin et al[19].

In our study E-coli was most resistant to Ampicillin, followed by Nalidixic acid and Norfloxacin. It was most sensitive to Nitrofurantoin (81.92%) followed by Amikacin (69.88%). The similar findings were seen in a study by Bashir MF et al [11] who concluded that the organisms showed resistance to older urinary antimicrobial agents such as ampicillin which indicates that increased consumption of a particular antibiotic can be a pathway to its resistance.

Antimicrobial resistance is a natural biological response of microbes to antimicrobial drugs. Resistance may be inherent.[20]

Our study showed the susceptibility pattern for E-coli as Nitrofurantoin > Amikacin > Impinem.

The susceptibility pattern for Klebsiella was Impinem >Amikacin > Ciprofloxacin and for Acinitobacter it was Amikacin >> Ciprofloxacin > Gentamycin and Cotrimoxazole.

All the three most frequently isolated organisms showed resistant to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid.

CONCLUSION

Higher prevalence of UTI was seen in females. In females UTI was seen in patients between 21-40 years age group and in males it was seen in older age group between 60-80 years. Gram negative organisms were the most commonly isolated organisms in UTI among which E. coli was the most frequent causative agent. Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid. The susceptibility and resistance patterns of urinary pathogens should be considered before starting empirical treatment for UTI. Development of resistance to commonly used antibiotics for treating UTI alert us against indiscriminate uasage of antibiotics to prevent development of resistance against an antibiotic.

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