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RESEARCH ARTICLE

SURVEILLENCE STUDY ON EMERGENCE OF URINARY TRACT INFECTION IN ERODE DISTRICT, TAMILNADU, INDIA

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ABSTRACT

The present study was carried out to detect the prevalence of Urinary Tract Infection (UTI) and antibacterial susceptibility pattern of isolated uropathogens at Erode district from May 2009 – July 2009. A total number of 300 patients (157 males and 143 females) in the age group ranging from 1 – 70 years were examined. Among them, only 94 persons exhibited significant bacteiuria and 60 % of total isolated organisms were found to be gram negative while remaining 40 % were gram positive. Among gram negative species, *Escherichia coli* (48.04 %) and gram positive coagulase negative *Staphylococcus* (15.67%) and *Enterococcus* (14.71%) were the most prevalent organisms. The antibiotic resistance of identified organisms was evaluated in which *E.coli* is more sensitive to Nitrofurantoin &Amikacin (69.39%) and is more resistant to Ampicillin (69.39%).

INTRODUCTION

Urinary Tract Infection is the most common bacterial infection prevalent in both male and female patients, causing discomfort in elderly patients, thus representing bacterimia, septic shock, respiratory disease syndrome and death (Naeem Akthar 2000, Nadia Gul *et al.,* 2004). Normal urine is sterile in the last 2/3 of urethra while it is passing through the urinary tract from the kidney.

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But it is commonly contaminated by bacteria of lower gastrointestinal tract due to close proximity with anal orifice (Higgins, 1995). There are various defense mechanisms in the body of men for prevention of the infection. The most important one is the flow of urine that washes bacteria out the body. The acidic p^H (5.5) and low osmolarity of urine also discharges the bacterial growth. Similarly there are number of factors that increase the risk of developing UTI (Acharya, 1992 and Sklar *et al.,* 1987). UTI is also caused by the interaction between the uropathogens and Generally the bacterial adherence is the first step in

emergency of an infection. *E.coli* is the most common urinary pathogen all over the world and is found to be the single most common species isolated in UTI patients (Nicolle 1999). The uropathogenic *E.coli* (UPEC) are found to cause 90% UTI in anatomically normal unobstructed urinary tract. The bacteria colonize from the feces or perineal region and ascend the urinary tract to the bladder. Although E.coli remains the most common organism in older patients, various groups of Gram positive and Gram negative bacteria have also been reported in affected individuals (Shafl *et al*., 1994 and Butt *et al*., 1995). Therefore there is a need to have an up – to – date awareness of bacterial pathogens prevalent in different age groups and their antimicrobial susceptibility patterns to help clinician to achieve this objective; the present study has been carried out at PMCH, Perundurai, Erode District, Tamil Nadu.

MATERIALS AND METHODS

Isolation and identification of UTI isolates

A total of 300 urine samples from suspected cases of UTI patients were collected from Perundurai Medical College ad Hospital (PMCH) Perundurai. For the isolation of UTI causing organisms, a loopful of urine samples were streaked on to various media such as nutrient agar, Mac Conkey agar, and blood agar and incubated at 37^0C for 24 hours. The isolated colonies were identified on the basis of standard cultural characteristics and biochemical reactions.

Identification of Gram negative bacteria

The bacterial isolates were subjected to identification tests using microscopic observations and examined their growth patterns by culturing on different media such as Mac Conkey agar, Eosin methylene blue agar , sugar (carbohydratate) fermentation (Lactose, glucose, sucrose and mannitol), TSI, IMViC (Indole, Methyl red (MR), Voges - Proskauer (Vp) and Citrate utilization) tests.

Identification of gram positive bacteria

Gram positive bacteria were identified by using microscopic observations and examined their growth patterns by culturing on different media such as Mannitol salt agar and blood agar, sugar fermentation, oxidase, catalase, coagulase, bacitracin and opptochin tests.

Maintenance of clinical isolates

Stock cultures were maintained in vials by growing the UTI isolates in 3 ml nutrient broth and were overlaid with 3 ml 40% glycerol. Then the vials were freezes at -70^0C for further use.

Statistical Analysis

For the purpose of statistical comparison, the existence of various age groups in accordance with the kind of uropathogens ANOVA – ONE WAY classification test was performed by using SPSS 16.0 VERSION.

Determination of antibiotics resistance profile

UTI isolates were subjected to screening of antibiotic resistance by Kirby-Bauer disc diffusion method. For this purpose, lawn of UTI isolates (compared with Mc Farland reaction standard 0.5)was made on Muller Hinton agar plates with a sterile cotton swap. Then, the standard antibiotic discs were placed on the lawn of culture and the plates were incubated at 37^0C for 24 hours. Following incubation, the presence or absence of zone of inhibition around the antibiotics disc was observed. The antibiotics used were Ampicillin (10 µg) Amikacin (30 µg), Ciprofloxacin (5 µg), Cephotaxime (30 µg), Cefixime (30 µg), Ceftazidime (30 µg), Chloramphenicol (30 µg), Cotrimaxazole (25 µg), Gentamycin (10 µg), Tetracycline (30 µg), Nalidixicacid (30 µg), Nitrofurantoin (300 µg).

RESULTS AND DISCUSSION

Urinary Tract Infections are a serious health problem affecting millions of people every year. The purpose of present study was to find out the existence of uropathogens and their susceptibility and resistance profile pattern. The prevalence of UTI varies by age, race, sex and temperature (Bachur *et al*., 2001).

Out of 300 urinary samples processed, only 94 samples were significant bacteriuria (31.35%), in which 40 samples out of 130 were from male patients (42.55%) and 38 samples out of

124 were from female patients (40.43 %) and only 16 out of 46 samples were from children (17.02%), which was shown in table – I. Depending on the bacteriological load in the urine sample, the treatment will varies which was correlated with the findings of Orrett, 2003. Urinary Tract Infection is the most common emerging problem from infants to adults (Shaw, *et al.,* 1998). Table 2, exhibits the age group and sex wise distribution of UTI. Both sexes were equally prone to UTI. This is because of number of risk factors includes, sex, age, pregnancy, catheterization, kidney stones, tumors, urethral structures, neurological diseases, congenital/acquired anomalies of bladder, vesico – ureteric reflux, suppressed immune system, diabetes mellitus, ureteric stresses etc.,(Sklar *et al*., 1987)

This study emphasis that, at the age group of 41–50 was more prone to UTI. Out of 94 positive samples, 23 samples (24.47%) were considered as having infection which was correlated by Bhowmick *et al*., 2004 in which at the age group of 41 – 50, out of 81 samples collected 49 were found to have UTI. Because urinary infection is extremely common & asymptomatic in elderly patients (Nicolle, 1997 & 2000) and it is also most common bacterial infection in older populations (Yoshikowa, 2000). It was serious infection experienced by both male and female and is particularly responsible for discomfort in older patients, thus representing a risk of bacterimia, septic shock, respiratory distress syndrome and death. Isolation and identification of the urinary isolates were done by using conventional methods (Sambrook *et al.,* 1989 and Khan *et al*., 1981). The existence of age group wise distribution of uropathogens (both gram positive and gram negative) was depicted in Figure 1.

Bacteriological studies usually reveal the involvement of gram negative enteric organisms that commonly cause UTI. From the figure – I and table III, it was clearly stated that the frequency of gram negative enteric bacteria causing UTI was more than gram positive bacteria. Among gram negative organisms, *Escherichia coli (*48.04%) was the most predominant organism, followed by *Klebsiella* sp., (8.82%). The percentage of gram positive isolates includes coagulase negative staphylococci (15.67%), followed by enterococci (14.71 %). Previous studies have also demonstrated that *E.coli* is the most frequent etiological agent causing community and hospital acquired UTI (Naida gul *et al*., 2004, Noor, *et al.,* 2004, and Gales, *et a*l., 2002).

The existence of age group wise distribution of uropathogens (both gram positive and gram negative) was depicted in Table 4. As per the statistical analysis, the results were also found to be significant. As the calculated F value (2.41) is greater than the table value (2.25) at 5%. We reject the hypothesis that there is significant difference in Age group and pathogen. Also, since the F value (22.15) is greater than the table value (2.34) at 5 %, we reject the hypothesis that there is significant difference in Age group and pathogen. All the isolates were screened for antibiotic susceptibility test by Kirby – Bauer disc diffusion method using commercially available antibiotic discs. In which, most of the isolates (both gram positive and gram negative) were found to be resistant against most of the antibiotics. Ambrouso, *et al*., 1994, stated that the pattern of bacterial pathogens causing UTI and their susceptibility to various antimicrobials also change with the passage of time. The predominant organism *E.coli* shows more resistance to Ampicillin (69.39 %) followed by ciprofloxacin (61.22 %) and cotrimaxazole (61.22 %), which was depicted in Table 5.

People at the age group of 41 – 50 were more prone to UTI. Out of 94 positive samples, 23 samples (24.47 %) were considered as having infection which was correlated with the work of Bhowmick *et al.,*(2004), In which at the age group of 41 – 50. Out of 81 samples collected 49 were found to have UTI. It is also investigated that urinary infection is extremely common and asymptomatic in elderly patients (Nicolle, 1997 and 2000) and is also a most common bacterial infection in older populations. It is a serious infection experienced by both male and female and is particularly responsible for discomfort in older patients, thus representing a risk of bacterimia, septic shock, respiratory distress syndrome and death(Naeem Akthar, 2000).

Antimicrobial resistant pattern of *E.coli* was given in figure – II. In contrast, *E.coli* exhibits more resistance to Ampicillin (69.39%) and more sensitive to Nitrofurantoin (69.39%) and Amikacin (69.39%) .

According to Kuper Szotch, 1981, there is a direct relation between the antibiotic used and the frequency and kinds of antibiotic – resistant strains in human beings. Epidemiological studies have suggested that antibiotic resistance genes emerge in the microbial population with in 5 years of the therapeutic introduction of an antibiotic, which was suggested by Chakrabarty, 1990.

Due to frequent use susceptibility to ciprofloxacin decreases in a stepwise manner (Karlowsky *et a*l., 2003) and resistance rates increasing among UTI isolates (Gales, 1998),which was clearly supported by our findings also. Hence widespread empirical use of fluroquinolones should be discouraged because of potential promotion of resistance (Nicolle, 2003).

From this study, we acknowledge that Nitrofurantoin is the drug of choice for the effective treatment of UTI. And also suggested that continuous monitoring of the pattern of organism causing UTI and their antimicrobial susceptibility should be carried out periodically because it was an essential step to provide to social basis for starting empirical therapy.

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Table 1. Incidence of bacteriuria in different sex

S.No	Sex	Total urine specimens cultured	Specimes with significant bacteriuria	
			No of samples	%
1	Male	130	40	42.55
2	Female	124	38	40.43
3	Children	46	16	17.02
	Total	300	94	

Table 5. Resistant pattern of *E.coli* among various antimicrobials

S. No	Name of antimicrobials	Total no. of strains			% resistance
		S	I	R	
1	Ampicillin	3	12	34	69.39
2	Amikacin	34	12	3	6.12
3	Chloramphenicol	20	24	5	10.2
4	Ceftazidime	12	15	22	44.9
5	Cephotazime	12	20	17	34.69
6	Ciprofloxacin	14	5	30	61.22
7	Cefixime	4	27	18	36.73
8	Cotrimaxazole	6	13	30	61.22
9	Gentamycin	9	25	15	30.61
10	Nalidixicacid	2	25	22	44.9
11	Nitrofurantoin	34	13	2	4.08
12	Tetracycline	7	25	17	34.69

Note: S-Sensitive; I – Intermediate; R – Resistant.

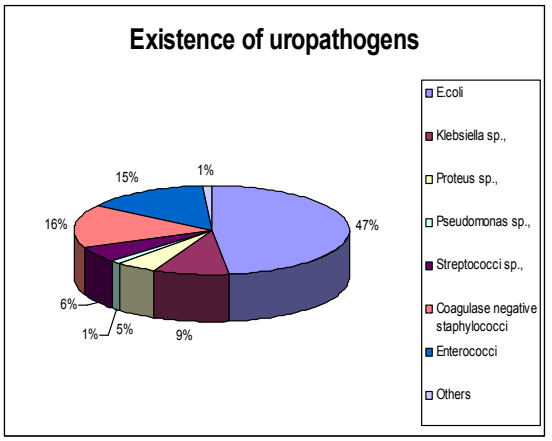

Fig. 1. I Pie diagram showing the relationship between age group and uropathogens.

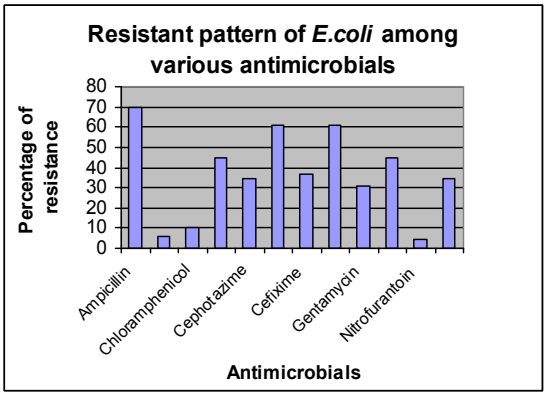

Fig. 2. Percentage resistance of *E.coli* to various antimicrobials

Table 2. Age group and sexwise distribution of UTI

S.No	Age groups	Sex		Total	
		Male	Female	No. of samples	%
1	0 - 10	10	8	18	19.15
2	11- 20	2	11	13	13.83