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Prevalence and Distribution of Various Microorganisms Found In Patients with Urinary Tract Infections Attending Tertiary Care Hospital In Chennai, Sep-Dec 2014.

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ABSTRACT

Urinary tract infection is one of the commonest infection affecting large section of population and one that is completely curable with proper treatment. Standard culture and biochemical characteristics of isolates aids in the bacterial identification. D isk diffusion method on the Mueller Hinton agar plates with and without 10µg of amoxyclav were. done on all isolates to identify the microbials. E. coli was the most often isolated microrganism (36% of the total isolates, followed by Klebsiella pneumoniae and Pseudomonas aeruginosa, Enterococcus sp., and Streptococcus agalactiae. Women (40%) were more infected with than men (34%). The lowest percentage of susceptibility of E. coli was manifested against piperacillin and ampicillin. ESBL production was also observed. It is important to evaluate the type of microbial organisms in urinary tract infections to prevent empirical use of drugs and the resulting development of resistance to antibiotics, especially in India.

Key words: UTI, E.Coli, piperacillin, ampicillin, antimicrobial resistance.

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INTRODUCTION

The urinary tract, from the calyces of the kidneys to the urethra, is lined with a sheet of epithelium that is continuous with that of the skin. The flow of urine and the sloughing of these epithelial cells serve to protect the urinary tract from infection. The pathogenic invasion of urothelium causes urinary tract infection with resultant inflammation involving a spectrum of upper and lower urinary track disease. These infections are classified as complicated or un complicated and range clinically from benign self-limited cystitis to urosepsis [1]. Urinary tract are one of the most common bacterial infection found both in community and in hospitals [2].Especially in women population, it is estimated that one out of three women will experince one episode of UTI during life time [3]. The predominant micro pathogen causing UTI is Escherichia coli [4].

However, other organisms cause greater foothold in patients with complicated UTI [5]. Compounded by a diminishing number of new agents entering clinical practice, resistance is widely recognized as a major threat to public health sectors. UTI is a serious ailment in human due to increasing frequency, recurrence and difficulty in eradication; it poses stiff challenge to the medical professionals. It is much more common in women than in men, due to anatomical and physiological reasons; by virtue of its position urinogenital tract is more vulnerable to bacterial infections caused by both internal and external flora [5]. UTIs are often treated with different broad-spectrum antibiotics, one with a narrow spectrum of activity may be appropriate because of emerging concerns about infection with resistant organisms, and antimicrobial susceptibility testing of the urinary pathogens constitutes the basis for antibiotic therapy. However, in view of the increasing bacterial resistance, regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy [6].

Entero bacteriaceae and *Escherichia coli* in particular are the notorious pathogens [7] causing infections by adhering to, invading, and replicating the umbrella cells of the bladder epithelium [8]. *E. coli* replication is facilitated by inflammation, leading to increased bacterial survival and invasion to the deeper layers of the urothelium. Consequently, these urothelial cells become reservoirs in which pathogens persist in a quiescent state becomes reservoirs and may be the source of recurrent UTIs. In general practice, there are concerns that some common infections are becoming increasingly difficult to treat and that complications due to antibiotic resistant bacteria may take longer to resolve. Aerobic nonfermenting gram-negative bacilli (nonfermenters) are a heterogeneous group of organisms that are either incapable of utilizing carbohydrates as a source of energy or degrade them via oxidative rather than fermentative pathway [9]. Risk factors include immunosuppression, trauma, foreign body, broad-spectrum antibiotic use, infused body fluids like saline irrigations and also urinary catheterization when infections are caused by these pathogens [10]. We present data on antimicrobial susceptibility and resistance in UTIs patients attending to Sree Balaji Medical College and Hospital in Chennai, Tamil Nadu.

MATERIALS AND METHOD

Isolation and Identification of Organisms: Clean Catch Mid-stream urine (CCMSU) specimens were collected from both inpatients and outpatients attending the Sree Balaji hospital at Chrompet in Chennai for routine culture and sensitivity test, for four months period from Sep 2014 were included in this study. All samples were inoculated on Mac Conkey and blood agar , incubated at 37°C for 24 hours, and for 48 hours in negative cases. A specimen was considered positive for UTI in view of the number of yielded colonies ($\geq 10^5$ cfu/mL) and the cytology of the urine through microscopic detection of bacteiuria and Polymorph nucleus (PMN) ≥8 leukocytes/mm3. These CCMSU specimens were studied for significant bacteuria by grams staining.

Susceptibility Testing:

In-vitro as per Clinical Laboratory Standards Institute (CLSI) guidelines antibiotic sensitivity test was performed by Kirby Bauer's disc diffusion method using Muller Hinton Agar and susceptibility pattern was noted. Antimicrobial agents tested were Norfloxacin (10µg), Gentamycin(10µg), Amoxy clav(30µg), Nalidixic acid(30µg), Ciprofloxacin(30µg), Ceftazidime(30µg), Chloramphenicol(30µg), Amikacin(10µg), Meropenem (30µg), piperacillin. The CLSI-ESBL phenotypic confirmatory test with ceftazidime, cefotaxime, ceftriaxone, and cefixime was performed for all the isolates by disk diffusion method on the Mueller-Hinton agar plates

with and without of amoxy clav. The Clinical & Laboratory Standard Institute (CLSI) criteria was followed in interpreting the susceptible result. A minimum of 5mm increase in the zone of diameter of third-generation cephalosporins, tested in combination with amoxy clav versus its zone when tested alone, was considered indicative of ESBL production. *E. coli* ATCC 25922 strain and *K. pneumonia* 700603 were used as reference strain for E.coli and klebsiella respectively.

RESULTS

Majority of patients belonged to the age group of 26 to 35 and years and most of them were females (Table-1). Out of the 17 *Pseudomonas aeruginosa* isolates which were resistant to commonly used antibiotics, 15 were from inpatients indicating the possibility of nosocomial infection. Patient surveillance was evaluated for UTI from 3 to100 days it was present as early as day 4 and as late as day 66, with a mean of 22.5 days. The first infections developed were caused mainly by *E. coli*, other Enterobacteriaceae and *Pseudomonas aeruginosa*. The secondary infections were caused mainly by *E. coli* (42%) and *Enterococcus* spp. (28.1%) The symptomatic correlation of UTI infection patients with positive symptoms were negative for pathological screening may be relating to other clinical correlations (Table 2).

Table 1: Bacterial load in patients of different sex and age groups and percentage of UTI infections

Age groups	Male			Female			UTI (%)
	Total no.	No. Infected	Infected percentage (%)	Total no.	No. Infected	Infected percentage (%)	
1-15	11	4	36	9	2	22	30
16-25	33	7	21	43	21	49	38
26-35	17	8	47	31	11	35	41
36-45	24	9	37	25	9	36	39
46-55	12	4	33	17	7	41	38
>=56	14	6	43	21	9	42	43
Total	111	38	34	146	59	40	38

Table 2: Table showing clinical signs and symptoms associated with UTI

Symptoms	% patients with positive growth and symptoms		% patients with negative growth and positive symptoms	
	Number	Percentage	Number	Percentage
Burning micturation	62	64	70	44
Fever	25	26	30	19
Increased frequency of urination	13	35	35	22
Lower abdominal/flank pain	16	17	19	12
Heamaturia	2	2	0	0
Pyuria	3	3	3	2

The *E. coli* was the most frequent (average of 36% of the total isolates) followed by *klebsiella* spp and *Pseudomonas aeruginosa.* In this study *Candida* isolates are not included, Gram-negative bacteria accounted for 91% of the UTI, while Gram-positive infections were responsible only for 9%. The *E. coli* is the predominant isolated pathogen from both sexes, it occurred more frequently in women (40 % in women compared to 38% in men). for the past few years, the susceptibility to cephalosporins, including generations 3 and 4, tends to decrease; this is coupled by an increase in the production of ESBL the susceptibility profiles of ESBL producing *E. coli* to families of antibiotics other than *beta*-lactams.

DISCUSSION

Infection of the urinary tract is one of the most common infectious diseases and it would affect all age groups peoples including men, women and children in worldwide [11]. The increasing prevalence of

infections caused by antibiotic-resistant bacteria makes the empirical treatment of UTIs difficult and outcome unpredictable [12]. In poor-resource settings where the availability of alternative effective antibiotics is limited, serious problems are anticipated in the treatment of multidrug resistant strains. Women are predisposed for UTI infections with 56% being infected in our study, the short urethra is considered to be a primary risk factor [13].This study is consistent with the findings of previous studies in which *E. coli* was the predominant pathogen isolated from patients with UTIs [14]. Many studies worldwide have also reported a sharp increase in ciprofloxacin resistant *E. coli* isolates from UTIs.

In this study *klebsiella* was the second most frequently isolated microorganism (29%) which is in accordance with many other studies [15]. *Pseudomonas aeruginosa is* an established pathogen of urinary tract. *Pseudomonas spp*. was the commonest non-fermenter isolate in the present study being significant in 17% of cases. This study revealed that for *Pseudomonas* spp. amikacin followed by ciprofloxacin in the group of first and second line antibiotics and also meropenem to be effective followed by cephalosporins in the group of third line reserved antibiotics.

The wide spectrum of infective organisms causing UTIs and the growing resistance to several strains of antibiotics makes it more mandatory to look for culture and sensitivity rather than empirically treating the urinary tract infections at a time when antimicrobial resistance is a major public health problem that we are facing.

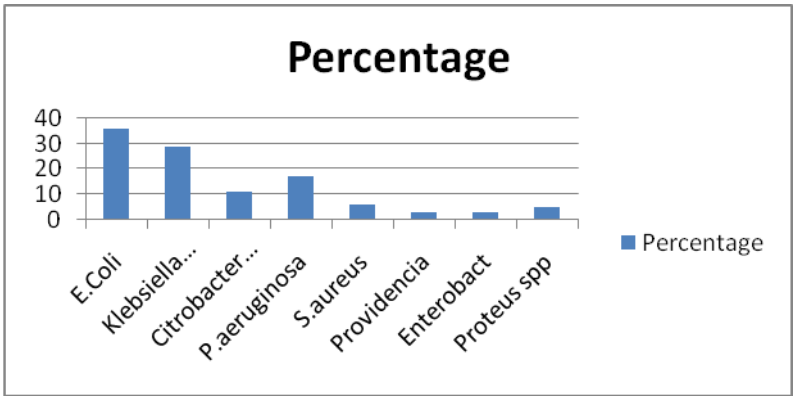

Figure 1: Percentage of organisms involved in UTI

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