Original Research Article

https://doi.org/10.20546/ijcmas.2017.612.031

Bacteriological Profile of Community Acquired Urinary Tract Infections and Antibiotic Susceptibility of Gram Negative Isolates

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A B S T R A C T

Urinary tract infections are amongst the most common infections encountered in clinical practice. Despite the wide spread availability of antibiotics, UTI remains the most common bacterial infection in the human population. UTI is predominantly a disease of females and is frequently acquired through the community. One of the common causes of uncomplicated community acquired UTIs is *Escherichia coli*. However the bacteria causing UTI may vary according to the different geographical areas. Hence we have undertaking this study to assess the prevalence of bacteria that causes community acquired UTIs and their antibiotic sensitivity pattern. 500 Mid-stream urine samples were processed and 108 bacterial isolates were isolated and processed for their antibiotic sensitivity profile against 12 different antibiotics. *Escherichia coli* is the most common isolate of 108 bacterial isolates and most commonly found in female than male in this study. Among all antibiotics, Norfloxacin is least sensitive (16.67 %). Antibiotics with good sensitivity are Imipenem (100%) and Meropenem (100%). Community acquired Urinary Tract Infections are most commonly seen in Females than in Males in our study and most commonly caused by *Escherichia coli*. Drug resistance is not much seen in our study.

Introduction

Urinary tract infections (UTI) are amongst the most common infections encountered in clinical practice and also the most common of the bacterial infections that leads patients to seek medical care (Palac, 1986). Approximately 10% of humans will have an episode of UTI at some point of time during their lives. This is also the most common hospital acquired infection, accounting for as many as 35% of nosocomial infections (Steven, 1989). 1×10^5 organisms/ml of a single bacterium corresponds to the presence of UTI. Urinary tract infection is predominantly a disease of females. Nearly 30% of women will have had a symptomatic UTI requiring antimicrobial therapy by age 24 and almost half of all women will experience a UTI during their life time (Mabeck, 1972).

Amongst several antimicrobial agents used for treatment of UTIs beta-lactam antibiotics have been the most trusted and useful agents

for many years. However, resistance to these antibiotics has been acquired by bacteria like *Escherichia coli* and *Klebsiella*, throughout the world (Singh *et al.,* 1997). The vast majority of urinary tract infections (UTIs) are caused by a single organism from a very limited spectrum of bacteria. In uncomplicated cases, the organism is almost always *Escherichia coli* or *S. saprophyticus* whereas in complicated cases, the spectrum is more diverse, encompassing several Enterobacteriaceae and Gram-positive organisms such as *Enterococci* (Gaterman and Stamm, 1998, 2005).

Resistance to antimicrobial agents was recognized more than 50 years ago. Since then it continues to be a major cause for increased morbidity, mortality and health care cost (Ang *et al.,* 2004). Earlier, drug resistant organisms were found in tertiary care centers and referral hospitals where the risk factors for their emergence were high. Many a times, this is because the treatment for them is empirical. But their recent isolation from the community has been a cause for concern. Drug resistant organisms like ESBLs from the community are discovered predominantly in patients with urinary tract infections (Johann *et al.,* 2005). Thus a knowledge of the bacterial profile and the antibiotic susceptibility pattern is essential to monitor the treatment and thus avoid the emergence of resistance among the bacteria (Macgree *et al.,* 1999).

The present study was thus designed to detect the bacteria and their antibiotic sensitivity and resistance pattern among patients with UTI.

Materials and Methods

This prospective study was conducted by the department of Microbiology on patients with urinary tract infections, attending MNR Medical College and Hospital, Fasalwadi,

Sangareddy dist after taking the institutional ethical committee approval. The study period was from September 2013 to February 2014. 500 Midstream samples of urine (MSU) from clinically suspected cases of Urinary Tract Infection attending the out- patient and in-patient Departments of MNR Medical College and Hospital were included in the present study. The clinical symptoms included patients with burning micturition, dysuria, frequency, urgency, suprapubic pain, fever with or without chills, haematuria and loin pain for duration of one week. Cultures yielding no growth, insignificant growths, patients with hospital acquired UTI were excluded from the study.

Clean catch, Mid-Stream Urine was collected in sterile universal container, transported to the laboratory as soon as possible taking sterile precautions and processed with in 1 hour. History of patients, prior antibiotic therapy, catheterization, any instrumentation, recent major or minor surgery on kidney or urinary tract etc. was recorded. Urine was processed soon after collection in order to minimize multiplication of any contaminating organisms if present.

Part of sample - was well mixed and using a standard loop, which delivers a volume of 0.001 ml of urine, was inoculated on to solid medium like Blood agar, MacConkey agar (Frimodt –Moller *et al.,* 2001), and the inoculated plates were aerobically incubated at 37^0C for 24 – 48 hours. Accordingly, 100 or > 100 colonies correspond to 10^5 or > 10^5 cfu /ml respectively. Colony count is multiplied with 1000 in order to give estimate of the organisms per ml of urine. Colonies were further processed by doing Gram's stain. Further identification and confirmation of organisms were done by the standard identification tests as described in Mackie and McCartney practical medical microbiology 14th edition.

Antibiotic sensitivity tests were done by Kirby-Bauer disk diffusion method. The test organism is subcultured into peptone water and incubated for 4-6 hours at 37 ^{0}C. The turbidity is standardized with 0.5 McFarland, and is swabbed over 90mm Mueller Hinton agar plate. Antibiotic disks were placed 15 mm from the edge of the plate and disks are evenly placed and incubated at 37^{0}C for 18 – 24 hours. Zones of inhibition were measured with a ruler and interpreted as per NCCLs guidelines (Wayne, 2009). The commercially available antibiotic disks supplied by High media (Mumbai) were used.

The panel of antibiotics used was Cotrimoxazole- 25 μg, Norfloxacin- 10 μg, Nalidixic Acid- 30 μg, Nitrofurantoin- 300 μg Ciprofloxacin-5μg, Levofloxacin-5μg, Gentamicin- 10 μg, Amikacin - 30μg, Ceftriaxone- 30, ceftazidime 30μg, Imipenum-10μg, Meropenem-10μg

Results and Discussion

A total of 500 mid-stream urine samples were processed and 108 organisms were isolated from them (Table 1). Culture positive cases were predominant in females with 73 cases (68%) than in males with 35 cases (32%) (Fig. 1). *Escherichia coli* is the most common isolate (68) followed by Coagulase negative *Staphylococci* (13), *Klebsiella pneumoniae* (09), *Proteus mirablis* (08), *Pseudomonas* spp (06), *Citrobacter* (02), *Enterococci* (02) (Table 2). Antibiotic sensitivity pattern of 12 different antibiotics were done in the study. All the isolates are sensitive to Imipenum and Meropenum (100%), followed by Levofloxacin (74.1%) and Amikacin (71.3%) (Table 3).

Prevalence of Drug resistant organisms varies widely in different regions of India. Recently emergence of drug resistant organisms like ESBLs from the community has led to increased concern among clinicians. Patients from remote areas in and around Sangareddy come to our hospital without any prior treatments. Antibiotic resistance organisms are not prevalent in our hospital.

As there was no data available on antibiotic sensitivity pattern of common bacteria that would help clinicians in treating infections effectively, this study was undertaken.

Table.1 Distribution of culture positive and negative cases

TOTAL CASES	NUMBER OF CULTURE POSITIVE CASES (**%**)	NUMBER OF CULTURE NEGATIVE CASES (**%**)
500	108(21.6%)	392 (78.4%)

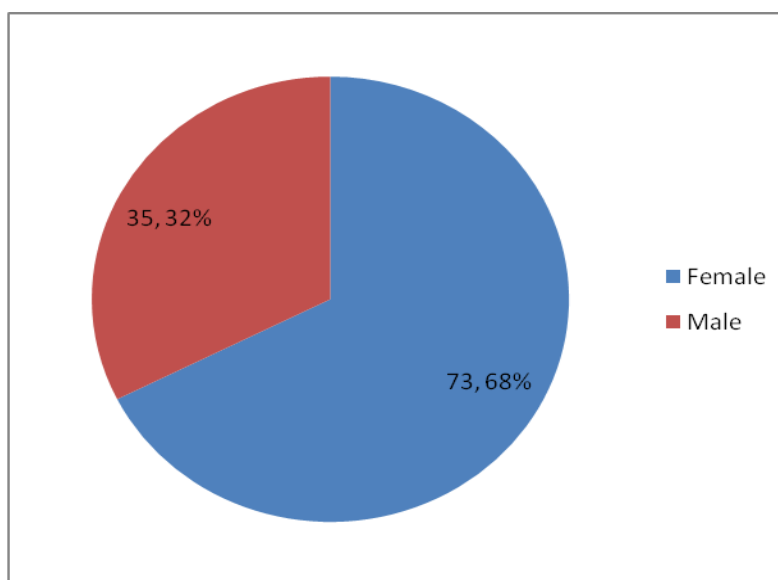**Table.2** Distribution of organisms causing UTI

ORGANISMS ISOLATED	TOTAL STRAINS ISOLATED (X)	PERCENTAGE OF INCIDENCE (X/108)
Escherichia coli	68	63%
K. pneumonia	09	8.3%
Citrobactor spp	02	1.9%
Proteus mirabilis	08	7.4%
Pseudomonas aeruginosa	06	5.6%
Enterococci	02	1.9%
CoNS	13	12%
TOTAL	108	100%

Table.3 Overall antibiotic sensitivity pattern

ANTIBIOTIC	% SENSITIVE	% RESISTANT
Co-trimoxazole	35.20	64.8
Norfloxacin	16.67	83.33
Nalidixic Acid	40.74	59.26
Nitrofurantoin	67.59	32.41
Ciprofloxacin	69.50	30.50
Levofloxacin	74.10	29.90
Gentamicin	64.81	35.19
Amikacin	71.30	28.70
Ceftazidime	46.30	53.70
Ceftriaxone	44.55	55.55
Imipenum	100.00	0.00
Meropenum	100.00	0.00

Fig.1 Distribution of culture positive cases based on sex

The present study revealed a female predominance among the subjects which correlated well with the studies of Das *et al.,* (1982), Gales *et al.,* (1998) and Modarres *et al.,* (1997). Among the organisms isolated in the study, *Escherichia coli* was the most frequent pathogen being isolated in 63% of the cases and *Klebsiella* spp. in 8.3% of the cases. Wattal *et al.,* (2005) in their study in New Delhi isolated *Escherichia coli* in 59% of the cases and *Klebsiella* spp in 10.2% of the cases. Babypadmini *et al.,* (2004) from Chennai reported 49% *Escherichia coli* and 8% *Klebsiella* spp (Babypadmini, 2004), (Supriya *et al.,* 2004). Chan *et al.,* reported 61% *E. coli* and 16% *Klebsiella* spp (Chan, 1987).

However, Das *et al.,* (1982) reported *Klebsiella* spp. as the most common pathogen causing urinary tract infection in hospitalized patients but even in this study, *Escherichia coli* was responsible for most of the infections among outpatients (Das, 1982).

High sensitivity pattern was noted towards Amikacin (73.1%) and Gentamicin (64.8%), which were in accordance to the work done by other authors (Kritu Panta, 2013) (Seyedah Afrooz Azmil *et al.,* 2014). All isolates (100%) were susceptible to Imipenem and Meropenem (Jaya Sankarankutty *et al.,* 2014), (Iraj Alipourfard Iraj Alipourfard, 2010). Quinolones were highly effective in our study.

Community acquired Urinary Tract Infections are most commonly seen in Females than in Males in our study and most common causative organism is *Escherichia coli*. Drug resistance is not much seen in our study. *Escherichia coli* (68%) was the commonest pathogen responsible for Community acquired urinary tract infection. Quinolones seems a reasonable alternative to Cephalosporins for the treatment of community acquired urinary tract infections.

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