

## Original Research Article

### Aerobic bacteriological profile of urinary tract infections in a tertiary care hospital

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#### A B S T R A C T

#### Keywords

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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. This study was done to determine the prevalence, etiologic agents of UTI and their antibiogram. A total of 568 mid-stream urine samples from the suspected UTI patients were tested microbiologically using standard techniques and antimicrobial susceptibility test was performed for the isolated pathogens using Kirby-Bauer disk diffusion method. The rate of culture positivity in females was 86.53% and in males was 27.54%. *E.coli* was the most frequently isolated urinary pathogen (41.73%), followed by *Klebsiella* spp (22.90%) and *Acinetobacter* spp (6.61%). *E.coli* was highly sensitive to Nitrofurantoin (82%) and Amikacin (71%) and it was highly resistant to Ampicillin (0.9%). *Klebsiella* spp was highly sensitive to Imipenem (39%) and it was highly resistant to Ampicillin (13%). Higher prevalence of UTI was seen in females. Gram negative organisms dominate the scenario. Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid. The antibiotic treatment should be limited to symptomatic cases and be initiated after sensitivity testing only.

#### Introduction

Urinary tract infections (UTIs) are among the most common bacterial infections and account for a significant part of the workload in clinical microbiology laboratories (Micheal et al., 2004). 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 (Das et al., 2006). 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 (Razak et al., 2012). Enteric bacteria (in particular, *Escherichia coli*) remain the most frequent cause of UTIs, although the distribution of pathogens that cause UTIs is changing (Micheal et al., 2004). The common etiologic agents of

UTI include enterobacteriaceae like *E. coli* and *Klebsiella* spp, as well as Gram positive organisms like *Staphylococci* and *Enterococci* (Iregbu et al., 2013). Urinary tract infections (UTI) are caused by pathogenic invasion of the urinary tract which leads to an inflammatory response of the uroepithelium. Proliferation of bacteria in the urinary tract is the cause of urinary tract infection (Sibi et al., 2011).

UTIs refer to the presence of microbial pathogens within the urinary tract and it is usually classified by the infection site: bladder [cystitis], kidney [pyelonephritis], or urine [bacteriuria] and also can be asymptomatic or symptomatic, UTIs that occur in a normal genitourinary tract with no prior instrumentation are considered as “uncomplicated,” whereas “complicated” infections are diagnosed in genitourinary tracts that have structural or functional abnormalities, including instrumentation such as indwelling urethral catheters, and are frequently asymptomatic (Getenet et al., 2011).

The main aim of the study is to determine the prevalence of UTI as well as the effect of gender and age on its prevalence. The etiologic agents and their susceptibility pattern will also be determined.

## **Materials and Methods**

The study was performed on UTI cases attending Alluri Sitarama Raju Academy of Medical Sciences, Eluru, from April 2013 to September 2013. A total of 568 clean catch midstream urine samples were collected in a wide mouth sterile container from the study subjects who have not received antimicrobials within the previous fifteen days. Then the bacterial uropathogens were isolated and tested for antimicrobial drug resistance pattern.

## **Bacterial isolation and identification procedures**

Isolation of uropathogens was performed by a surface streak procedure on both blood and MacConkey agar using calibrated loops for semi-quantitative method and incubated aerobically at 37<sup>0</sup>C for 24 hours (Gerald Collee. J et al., 2012). The urine should be mixed thoroughly before plating (Patricia M. Tille., 2014). A specimen was considered positive for UTI if a single organism was cultured at a concentration of  $\geq 10^5$ cfu/ml. Colonial appearance and morphological characters of isolated bacteria was noted and isolated colonies were subjected to preliminary tests like Gram’s staining, motility by hanging drop, catalase test and oxidase test. These preliminary tests were followed by biochemical reactions for the identification of the isolated organism. All the biochemical tests were used to identify the bacteria.

## **Antibiotic sensitivity**

It was done by Kirby Bauer disk diffusion method. Mueller-Hinton agar plates were used. Commercially available HiMedia discs were used. The bacterial suspension was made by inoculating 4-5 isolated identical colonies in peptone water. After 2 hours of incubation, the turbidity was standardized by using 0.5 Mc Farland standards.

By using sterile swab, a lawn culture was made on the Mueller-Hinton agar plates. The 6-8 antibiotic discs per plate were placed and inoculated plates were incubated at 37<sup>0</sup>C. The results were read after overnight incubation and compared with the standard chart. The following antibiotics used were: Nitrofurantoin (300 $\mu$ g), Amikacin (30 $\mu$ g), Cotrimoxazole

(25µg), Gentamycin (10µg), Ciprofloxacin (5µg), Ceftriaxone (30µg), Nalidixic acid (30µg), Norfloxacin (10µg), Ampicillin (10µg) and Imipenem (10µg).

## Results and Discussion

A total of 568 samples were collected during the study period of which 401 (70.59%) were from females and rest 167 (29.40%) samples were from males. Pathogenic bacteria were isolated in 393 samples with prevalence rate of 61.91%. The prevalence in females was 86.53% and in males was 27.54% and the prevalence pattern in males and females is shown in table 1.

UTI was most commonly seen in the age group of 21-40 years as 48.34% 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 commonly isolated urinary pathogen (41.73%), followed by *Klebsiella* spp (22.90%) and *Acinetobacter* spp (6.61%). The isolation rates of other organisms are shown in chart 1.

*E.coli* showed high sensitivity to Nitrofurantoin and Amikacin and it showed high resistance to Ampicillin and Nalidixic acid. *Klebsiella* spp and *Acinetobacter* spp were highly sensitive to Imipenem and Amikacin respectively. The sensitivity pattern to other antibiotics is shown in table 3.

Bacterial infection of the urinary tract is one of the common causes for seeking medical attention in the community (Getenet. B et al., 2011). Urine is one of the sterile body fluids but the presence of bacteria in urine is called bacteriuria

(Khalil Ahmed et al., 2008).

In our study, the prevalence rate of isolation of urinary pathogen was 61.91% which correlates with the studies of Shamataj Razak S.K et al (2012) (71.72%) and Das RN et al (2006) (71.6%).

Prevalence of UTIs was more in females when compared to males. This correlates with other studies by Bashir MF et al (2008) and Getenet B. et al (2011). Women are more prone to UTIs than men because of short urethra and it is closer to the anus (Dielubanza EJ et al., 2011). Higher proportions of patients were in the age group between 21-40 years (46.30%) followed by 41-60 years (24.82%) age group. This was in consistent with the study of Beyene G et al (2011) in which 53.5% were in the age group between 21-40 years.

Among patients with UTI, females were most commonly in the age group between 21-40 years and males were between 41-60 years. This was in consistent with a study by Susan AMK (2005) 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 probably because of prostate enlargement and other related problems of old age.

*E.coli* (41.73%) was the most common isolated organism in our study. This was in correlation with other studies by Gupta K.D et al (1999), Moges et al (2002) and Sibi et al (2011). The second most common isolated pathogen was *Klebsiella* spp in our study accounting for 22.90%. This correlates with the studies of Khameneh et al (2009) and Chin et al (2011).

**Table.1** Sexual distribution - Prevalence of Urinary Tract Infection

Sex	Total no. of samples	No. of positives	Prevalence
Males	167	46	27.54%
Females	401	347	86.53%

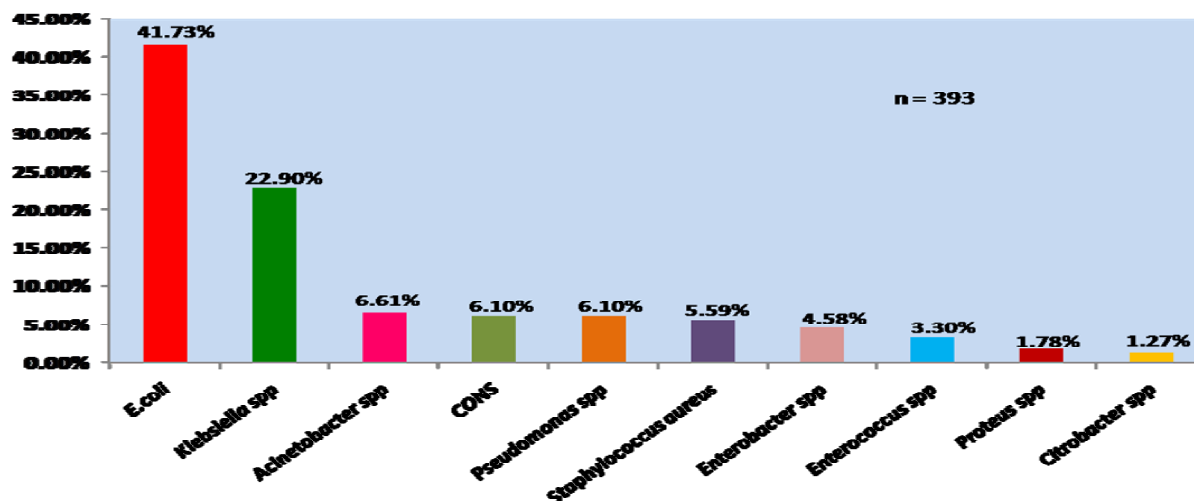
**Table.2** Age Wise Distribution - Prevalence of Urinary Tract Infection

Age (years)	Total no. of samples	No. of positive samples		
		Males	Females	Total
<20	89(15.66%)	3(6.52%)	70(20.17%)	73(18.57%)
21-40	263(46.30%)	9(19.56%)	181(52.16%)	190(48.34%)
41-60	141(24.82%)	23(50%)	72(20.74%)	95(24.17%)
61-80	72(12.67%)	9(19.56%)	23(6.62%)	32(8.14%)
>80	3(0.52%)	2(4.34%)	1(0.28%)	3(0.76%)
Total	568(100%)	46(100%)	347(100%)	393(100%)

**Table.3** Percentage of Antibiotic Susceptibility Pattern of Most Frequently Isolated Microorganisms

	<i>E.coli</i> (%)	<i>Klebsiella spp</i> (%)	<i>Acinetobacter spp</i> (%)
Ampicillin	0.9	13	11
Amikacin	71	37	47
Cotrimoxazole	31	23	28
Ciprofloxacin	11	31	40
Ceftriaxone	32	22	27
Gentamycin	27	15	29
Imipenem	37	39	13
Nitrofurantoin	82	20	18
Nalidixic acid	3	18	16
Norfloxacin	7	31	16

**Chart.1** Urinary Pathogens isolated



In our study, *E.coli* was most resistant to Ampicillin, followed by Nalidixic acid and Norfloxacin. It was most sensitive to Nitrofurantoin (82%) followed by Amikacin (71%). The similar findings were seen in a study by Bashir MF et al (2008). This might be due to 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 (Ahmed K, 2008).

In our study, *E.coli* showed 82% sensitivity to Nitrofurantoin, followed by Amikacin (71%) and Imipenem (37%). *Klebsiella* spp showed 39% sensitivity to Imipenem, followed by Amikacin (37%) and Ciprofloxacin (31%). *Acinetobacter* spp was sensitive to Amikacin (47%), followed by Ciprofloxacin (40%) and Gentamycin (29%).

The most frequently isolated organisms (*E.coli*, *Klebsiella* spp and *Acinetobacter* spp) showed resistance to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid. This high resistance of antibiotics is attributable partly to self medication, which is very common in the community and partly due to treatment of patients by the physicians without proper diagnosis in the laboratory (Khalil Ahmed et al., 2008).

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 41-60 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. On the basis of this study we can conclude that the resistance of commonly used antibiotic is very crucial. The antibiotic treatment should be limited to symptomatic urinary tract infections and be initiated after sensitivity testing only.

As drug resistance among pathogens is an evolving process, routine surveillance and monitoring studies should be conducted to provide physicians with knowledge about the most effective empirical treatment of UTIs. All efforts to minimizing the spread of resistant bacteria through appropriate infection control would be quite important and may represent a first step in resolving the issue of resistant microorganisms.

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