



## MICROBIOLOGICAL URINALYSIS & CULTURE -AUTOMATED METHODS FOR EARLY AND ACCURATE DETECTION

**Dr. Mohd. Nasaruddin**

Consultant Microbiologist, GYD Diagnostics & Reference Laboratories (P) Ltd

**Dr. aushik Hyder**

MD, Consultant Biochemistry

**Dr. Md. Ilyas Ahmed**

Paediatrician

### ABSTRACT

**Introduction:** Urinary tract infections (UTIs), occur frequently in both hospital and community settings, are some of the most common bacterial infections. Management of urinary tract infections (UTIs) is compounded by the rising rates of resistance to antimicrobials. **Methods:** A total of 100 patients clean catch midstream urine (MSU) samples were collected aseptically and analyzed. Complete Urine analysis was done by using ROCHE COBAS U411 analyzer and culture was processed by Beckman Coulter Microscan autoSCAN 4 System. **Results:** The study revealed 29/100 (29%) UTI prevalence among patients. The incidence of UTI was more common among >60 years age group (48.27%). Escherichia coli (34.4%) was the most prevalent bacterial uropathogen. **Conclusion:** Given the increasing trend toward antibiotic resistance, there is a need for bacteriological cultures and continuous surveillance of uropathogen antibiotic susceptibility. Fast processing by automated methods accelerates the clinical analysis while high accuracy and the high quality provides reliable and safe results.

### KEYWORDS :

#### INTRODUCTION

Patients with urinary tract infections [UTIs] present to both primary and secondary care, and can carry a significant burden of morbidity and cost.<sup>1</sup> UTIs can vary in presentation, ranging from pain and lower urinary tract symptoms, to urosepsis with severe inflammatory response syndrome and organ failure. It is essential to identify infections of the urinary tract and institute prompt treatment in order to reduce the potential for life long morbidity.

Basically UTIs are classified into the following three forms:

1. Asymptomatic bacteriuria
2. Lower Urinary Tract Infection – Cystitis, prostatitis, urethritis
3. Upper Urinary Tract Infection – Pyelonephritis

The detection of significant numbers of pathogenic bacteria from urine culture has remained the gold standard for the diagnosis of urinary tract infection since Kass defined  $>10^5$  CFU/ml of a single pathogenic bacterium isolated from urine culture as being significant.<sup>2</sup> The urine collected for culture must always be collected carefully in order to prevent the contamination with periurethral flora growth. Washing the genitalia with soap and water before collection minimizes the risk of contamination.<sup>3</sup>

Early and precise diagnosis of urinary tract infection is very essential to initiate proper antibiotic therapy. Unless proper antibiotic is not administered it would not be able to alleviate the symptoms of UTI. Recently, the treatment of UTIs is hampered by the increasing rise of resistance to commonly used antimicrobial agents.<sup>4</sup> The recent rise in the incidence of extended spectrum  $\beta$  lactamase producing [ESBL] present a particular challenge as they frequently require hospitalisation and prolonged treatment with carbapenam antimicrobials, as well as carrying the potential to rapidly develop into severe and life threatening infections. Automated urinalysis and culture system now a days have become ideal system for early detecting difficult organisms with high accuracy.

Hence keeping this view in mind, the present study is designed to study Urinary Tract Infections (UTI's) caused by various micro-organisms, their susceptibility and resistance patterns to various antimicrobial agents by automated methods which

would help to institute early hospital infection control measures.

#### MATERIALS AND METHODS :

To assess the local prevalence of urinary pathogens, a retrospective analysis of all urine microbiology specimens over a four months period giving a total of 100 individual patients [54 male, 46 female], from June 2022 to September 2022 received at our centre, Hyderabad, Telangana was done. Culture samples were also compared with urinalysis reports analyzed by ROCHE COBAS U411 system.

The clean mid-stream catch urine specimen was inoculated into blood and mac conkey agar plates/CLED agar plates using a 0.01 millilitre calibrated loop. All plates were then incubated at 35-37°C for about 24 hours under aerobic condition. On culture of the mid-stream sample of urine, a colony count of more than  $10^5$  /ml organisms of a single species of bacteria were considered to be significant.

Samples with insignificant growth, mixed growth of three or growth of non-pathogens were not considered to be culture positive.

#### Identification & Antibiotic Susceptibility Testing:

The Beckman Coulter MicroScan Microbiology autoSCAN-4 instrument was used to identify organisms and determine antimicrobial susceptibility patterns. The panels were inoculated with bacterial colony and incubated for a specific amount of time. After incubation, panel was loaded into the panel drawer, read and analyzed and results were processed using LabPro software.

#### RESULTS:

During the 4 months study period, a total number of 100 patients were studied. Total number of culture positive :29

#### Age Distribution:

**Table 1: Age Distribution among the Study Population**

AGE GROUP (IN YEARS)	NUMBER	No.of Positive cases
< 20	4	1(3.45%)
21-30	4	1(3.45%)
31-40	9	4(13.7%)

41-50	21	1(3.45%)
51-60	23	8(27.5%)
>60	39	14(48.27%)
Total	100	29

Among 100 samples collected, 54 samples were of Male patients and 46 samples were of females. The culture positivity in males was 55.1% (16/54) and in females was 44.8% (13/46)

A total of 19 culture positive (86.4%, 19/22) were positive in patients with >5 pus cells in complete urine examination whereas 25.6% (10/39) were culture positive in patients with <5 pus cells in urinalysis analyzed using automated ROCHE COBAS U411 machine.

**Table 2 : Culture profile of microorganisms causing UTI**

Micro organism	No. of UTI (n=29)	Percentage
Escherichia coli	10	34.4%
Klebsiella species	3	10.3%
Pseudomonas species	8	27.5%
Coagulase negative Staphylococci (CoNS)	2	6.89%
Proteus species	2	6.89%
Enterobacter aerogenes	1	3.44%
Acinetobacter species	2	6.89%
Citrobacter freundii	1	3.44%
Total	29	

Out of 29 positive isolates, seven (24.1%) were ESBL producers and nine (31.03%) were Carbapenem resistant.

**Table 3 : Antimicrobial Resistance Pattern of The Organisms Grown on Culture**

Antibiotic	Resistance Percentage (%)
Nitrofurantoin	44.8%
Cefotaxime	68.9%
Amikacin	24.1%
Ceftazidime	55.1%
Amoxycylav	55.1%
Norfloxacin	58.6%
Imipenem	34.4%
Meropenem	31.03%
PiPTAZ	31.03%
Co-Trimoxazole	37.9%

**DISCUSSION**

Urinary tract infections are one of the most common and serious infections found in population. They are also a serious cause of morbidity and lead to permanent sequelae which includes diseases like hypertension and renal failure. Hospitalized patients may be at increased risk of developing UTI because of advanced age, due to the presence of underlying diseases such as diabetes mellitus or stroke, or because of urinary tract obstruction<sup>5,6</sup>

The prevalence of UTIs (29/100, 29%) in this current study was found to be almost similar to the ones previously recorded in the following studies i.e: 67/300 (22.33%) by Tibyangye et al.<sup>7</sup> and 82/339 (24.2%) by Odongo et al<sup>8</sup>. It is less when compare to 54/139 (38.8%) registered by Kabugo et al<sup>9</sup>.

Among culture positive cases, 34.4% grew E.coli followed by Pseudomonas 27.5%. Worldwide, the most frequent bacterial etiology for UTI is Escherichia coli<sup>10</sup> In our study, E. coli was the most common isolate. This is similar to studies from other tertiary care centers.<sup>11,12,13</sup> The antimicrobial susceptibility pattern of present study is clearly indicating decrease sensitivity trends for quinolones group of drugs and high susceptibility as regards of Amikacin which is similar to those reported by Shalini et al & AshaPai KB et al.<sup>14,15</sup> High antibiotic resistance warrants careful selection and the

conservative use of antibiotics, as no local guidelines available. In a randomized controlled trial a multifaceted diagnostic and treatment algorithm that incorporated evidence-based guidelines for obtaining urine cultures and starting antimicrobial therapy was found to be effective in reducing inappropriate antibiotic use in nursing home residents with bacteriuria<sup>16</sup>. Perhaps a similar approach would also be effective in hospitals. The implementation of an antimicrobial stewardship program may also assist in optimizing antibiotic utilization in hospitals<sup>17</sup>.

**CONCLUSION:**

Our study concluded that UTI is, in fact, creating problems related to elderly with more than 60 years age patients care, and E. coli was found to be the most prevalent pathogen, The bacterial culture remains an important test in the diagnosis of UTI, not only because it helps to document infection, but also because it is necessary for identification of the infecting microorganism(s) and for antimicrobial susceptibility testing. The susceptibility and resistance patterns of urinary pathogens should be considered before starting empirical treatment for UTI. The present study confirms that bacterial resistance would be a greatest problem. Self-medication because of over the counter availability of antibiotics and secondly the unwanted prescriptions of antimicrobials by physicians make the situation worst by development of resistance to commonly used antibiotics for treating UTI. A continuous review of antibiograms is also necessary to track changes in aetiological agents and antimicrobial patterns to help in empirical treatment.

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