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ORIGINAL ARTICLE

SIMPLE NON-CULTURE METHODS FOR RAPID LABORATORY DIAGNOSIS OF URINARY TRACT INFECTIONS IN A TERTIARY CARE HOSPITAL

KHAN A H^{1*}, ZAMAN M K², HOSSAIN M S³, RAHMAN M A⁴, SAMAD M A⁵.

1. Dr. Md. Abul Hossain Khan, Associate Professor & Head, Dept of Microbiology, TMSS Medical College, Bogra

2. Dr. Md. Khairuzzaman, Associate Professor & Head, Dept of Microbiology, Prime Medical College, Rangpur

3. Dr. Md. Shahadat Hossain, Associate Professor, Dept of Pathology, Prime Medical College, Rangpur

4. Dr. Md. Afzalur Rahman, Professor (cc), Dept of Biochemistry, Prime Medical College, Rangpur

5. Dr. Md. Abdus Samad, Associate Professor, Dept of Community Medicine, Prime Medical College, Rangpur

* Corresponding Author

ABSTRACT

Background: Urinary tract infections (UTIs) are among the most common bacterial infections and account for a significant part of the workload in clinical microbiology laboratories. Physicians distinguish UTIs from other diseases that have similar clinical presentations with diagnostic tests confusion. **Objective:** This study was undertaken to find out the simple and rapid diagnostic tests for Urinary tract infections in tertiary care hospital. **Methodology:** This cross sectional study was carried out in the Department of Microbiology at Prime Medical College from December 2012 to January 2014 for a period of 12 months. Specimens were process for microscopy and bacteria were isolated and identified according to standard laboratory procedure. **Result:** A total of 494 urine specimens were collected. Among them 212 urine were showed culture positive (42.9%), pyuria 272(55.0%), bacteriuria 240 (48.6%) and both pyuria and bacteriuria 225 (45.5%). **Conclusion:** It was concluded that the simple easy aid to diagnosis of Urinary tract infections were microscopy for pyuria and bacteriuria in comparison with time consuming bacteriological culture.

Key words: UTI, Pyuria, Bacteriuria.

INTRODUCTION

Urinary tract infections (UTIs) are among the most common bacterial infections. It has been estimated that symptomatic UTIs result in as many as 7 million visits to outpatient clinics, 1 million visits to emergency departments, and 100,000 hospitalizations annually¹. UTIs have become the most common hospital-acquired infection, accounting for as many as 35% of nosocomial infections, and they are the second most common cause of bacteremia in hospitalized patients^{2,3}. Physicians must distinguish UTI from other diseases that have a similar clinical presentation, some UTIs are asymptomatic or present with atypical signs and symptoms, and the diagnosis of UTIs in neutropenic patients (who do not typically have pyuria) may require different diagnostic criteria than those used for the general patient population⁴. Several rapid screening tests are used commonly to make a presumptive diagnosis of UTI, among them microscopic examination of urine for pyuria and bacteria. Gram stain

of uncentrifuged urine specimens is a simple method. Numerous studies have been published concerning the usefulness of these tests in diagnosing UTI^{5,6}. In fact, in many clinical laboratories, urine cultures are the most common type of culture, accounting for 24%-40% of submitted cultures; as many as 80% of these urine cultures are submitted from the outpatient setting⁷. Urine cultures are necessary for outpatients who have recurrent UTIs, experience treatment failures, or have complicated UTIs. Urine cultures are also necessary for inpatients developing UTIs. 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 determination of the identity of the infecting microorganism(s) and for antimicrobial susceptibility testing. The most commonly used criterion for defining significant bacteriuria is the presence of 10⁵ cfu per milliliter of urine⁸.

So, the aim of the study was designed to determine the rapid and easy laboratory procedure for diagnosis of UTI in tertiary care hospitals.

MATERIAL AND METHODS

This cross sectional study was conducted in the department of Microbiology, Prime Medical College during the period from 1st December 2012 to 1st January 2014. A total of 494 urine samples from OPD and IPD, irrespective of age and sex at Prime Medical College Hospital were examined by standard laboratory methods. Relevant history, laboratory record and findings was recorded in a predesign data sheet and subsequently analyzed by manually.

SPECIMEN COLLECTION

Suprapubic aspiration is the best method to avoid contamination of specimens with bacteria in the distal urethra. But this collection method is used infrequently except in rare circumstances. Collection of urine by use of a single catheter (straight catheter technique) is the next-best technique for obtaining urine specimens with minimal contamination but, again, it is not indicated clinically for most patients because it is too labor intensive and costly for routine use and it is invasive. It has added disadvantages, because the process of inserting a catheter through the urethra can introduce bacteria into the bladder and thereby cause UTI. Most urine specimens are obtained from adult patients via the clean-catch midstream technique. This technique has the following advantages: it is neither invasive nor uncomfortable, it is simple and inexpensive, it can be performed in almost any clinical setting, there is no risk of introducing bacteria into the bladder by catheterization and there is no risk of complications. Colony counts from urine specimens collected by this method correlate reasonably well with those of specimens collected via suprapubic aspiration or straight catheterization¹⁵. The obvious disadvantage of this technique is that the urine sample passes through the distal urethra and can become contaminated with commensal bacteria. Simple procedures that have been developed to decrease the contamination rate include cleansing of skin and mucous membranes adjacent to the

urethral orifice before micturition, allowing the first part of the urine stream to pass into the toilet, and collecting urine for culture from the midstream⁹.

SPECIMEN PROCESSING

Routine urine cultures should be plated using calibrated loops for the semiquantitative method. This method has the advantage of providing information regarding the number of cfu/mL, as well as providing isolated colonies for identification and susceptibility testing. The types of media used for routine cultures were limited to Hi-chrome (Chromogenic media), CLED, blood agar and MacConkey's agar. Cultures plates were incubated overnight at 35...C-37...C for a full 18-24 hours in ambient air before being read.

NONCULTURE METHODS FOR THE RAPID LABORATORY DIAGNOSIS OF UTI

Detection of pyuria by microscopy

Pyuria was detected and quantified microscopically by measuring the urinary pus cells from centrifuge deposit drop on slide covered by cover slip and examined under microscope focus on high power field. The advantages to urine microscopy were that dead leukocytes, leukocyte casts, and other cellular elements were observed directly. Patients with symptomatic UTIs have urinary dead leukocyte more than 10/hpf¹⁰ and it was the most practical microscopic method involves counting the number of leukocytes in the sediment of centrifuged urine specimens.

Detection of bacteriuria by microscopy

Bacteriuria were detected microscopically using direct observation of bacteria in urine specimens wet film preparation and Gram staining of uncentrifuged urine specimens. A loopful volume of urine is applied to a glass microscope slide, allowed to air dry, stained with Gram stain, and examined microscopically. The urine Gram stain test has the important advantage of providing immediate information as to the nature of the infecting bacterium and thereby guiding the physician in selecting empiric antimicrobial therapy.

LABORATORY DIAGNOSIS OF UTIs BY CULTURE

All samples were routinely cultured on Hi-chrome (Chromogenic media), CLED, MacConkey and blood agar plates. These plates were routinely incubated at 37...C aerobically and after overnight incubation, they were checked for bacterial growth.

RESULTS

In this study, a total of 494 urine sample were tested during the period of December 2012 to January 2014. Culture positive rate were showed in Table-I and figure-I. The culture positive rate was 42.9%. Culture positive rate showed in Table-I:

Number of urine sample tested	Culture negative	Culture positive
494	282(57.1%)	212 (42.9)

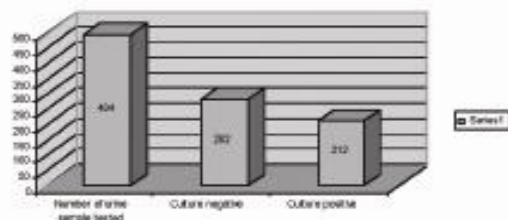


Figure-I: Bacterial isolation rate in the study sample

Pyuria as microscopic finding was shown in Table-II & Figure-II. Significant numbers of pus cells were found in 272 urine samples. The percentage of pyuria(55.1%) was higher than the rate of culture positive.

Table-II: Microscopy for Pyuria

Number of urine sample tested	Pyuria	Percentage
494	272	55.1%

Bacteriuria was another microscopic finding showed in Table-III & Figure-II. Presence of bacteria in urines were found in 240 urine samples. The percentage of bacteriuria(48.6%) was also higher than the rate of culture positive.

Table-III: Microscopy for Bacteriuria

Number of urine sample tested	Bacteriuria	Percentage
494	240	48.6%

The findings of both pyuria and bacteriuria was showed in Table-IV& Figure-II. Presence of both pyuria and bacteria in urine were found in 225 urine samples. The percentage was 45.5% which was nearer to the rate of culture positive.

Table-IV: Microscopy for Both Pyuria and Bacteriuria

Number of urine sample tested	Pyuria & Bacteriuria	Percentage
494	225	45.5%

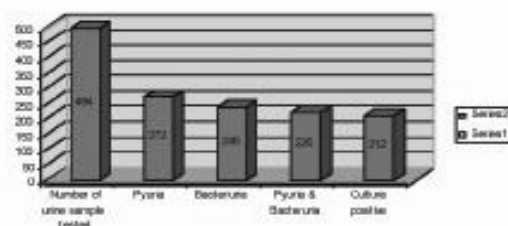


Figure-II: Comparison between Non-culture (Pyuria, Bacteriuria, both Pyuria & Bacteriuria) and culture technique in the study sample

DISCUSSION

Most patients with uncomplicated acute cystitis have cases that are clinically straightforward, and they may not require any laboratory testing beyond urinalysis. For a significant number of patients, however, the clinical history and easy laboratory findings may be sufficient to make a definitive diagnosis of UTI. For those patients and for patients with complicated UTIs, laboratory tests are necessary to make the diagnosis and to provide specific information regarding the identity and the antimicrobial susceptibility pattern of pathogens. In this study, culture positive rate was 42.9%. The predominance of infection agreed with the report of Parvin et al. They found 50% irrespective of sex¹¹. In another study from Kenya by Kebira et al found 50% in all age group irrespective of sex¹².

This study of tests for urinary tract infection is made difficult by the lack of an absolute standard against which to judge them. Since 1956 colony counts of 10^5 per ml have been considered to indicate infection,⁷ but it is now believed lower counts may indicate infection.¹³⁻¹⁵ Since, as is commonly the case, the local microbiology laboratory in this study only reports growths of 10^5 per ml or more, this had to be used as the criterion of infection.

This study suggests that the pyuria and bacteriuria of the urine is of much value in rapid diagnosis of UTIs. Almost certainly examination of the urine immediately after it is passed is necessary if its appearance is to be useful in diagnosis. Simple microscopy of the urine is recommended in textbooks for the diagnosis of urinary tract infection.⁴ However, a recent study from Devon and Cornwall found that less than a third of general practices had a microscope;¹⁶ this instrument also appears to be rare on the modern hospital ward. A previous study in general practice,¹⁷ involving a practice technician and centrifuged urine samples, showed the value of urine microscopy.

CONCLUSION

In the conclusion, microscopy of wet and stain preparation of uncentrifuged urine for bacteriuria and centrifuged urine for pyuria were the rapid screening tests in diagnosis of uncomplicated symptomatic urinary tract infection adult patients in comparison with time consuming bacteriological culture. Although cultures identify pathogens, the accurate interpretation of culture results requires for treatment and further research.

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