ISSN: 2279 - 0594

Available Online at www.jbpr.in

Journal of Biomedical and Pharmaceutical Research 2 (6) 2013, 63-64

RESEARCH ARTICLE

DIAGNOSIS OF URINARY TRACT INFECTION: FRESH URINE MICROSCOPY OR CULTURE

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Received 10 October 2013; Revised 22 October 2013; Accepted 25 October 2013

ABSTRACT

The study was conducted in the department of Microbiology, Nobel Medical College and Teaching Hospital, Biratnagar, to assess whether urine microscopy is effective enough to diagnose urinary tract infection or not.

The retrospective study conducted in patients coming to Microbiology Lab reveals that out of 600 patients enrolled in the study in 2 months (January 2013 to March 2013), the results obtained from the urine microscopy is not less better than the results obtained from the urine culture.

Key Words: UTI, Bacteriuria, Significant Bacteriuria, Pyuria, Midstream Urine, AST

INTRODUCTION:

Urine is normally sterile body fluid when inside the urinary tract but can pick up commensals and pathogens when exiting through urethra. Bacteria in urine usually indicate UTI, cystitis, pyelonephritis or prostitis. UTIs are the second most common types of infection diagnosed in the USA. Not only are these infections uncomfortable and painful if left untreated or treated ineffectively, they pose serious health problems.

The causative organisms of UTI are dynamic in terms of their virulence and resistance patterns leading to challenges in the prevention and treatment of UTI. This is of relevance in both primary and secondary care and many of challenges are similar in both developed and developing countries alike.UTI is also associated with considerable cost in terms of morbidity, economic and research expenditure[1].

Women are especially prone to UTI for anatomical reasons. For women life time risk of having UTI is greater than 50% [2]. People with spinal cord injury or other nerve damages around bladder have difficulty in emptying bladder completely, allowing bacteria to grow in urine that stays in the bladder. People with abnormalities of urinary tract that obstruct the flow of urine e.g. renal stones, enlarged prostrate are also at a greater risk of suffering from UTI. People with diabetes and people with problems of body's natural defense system also have greater chances of catching UTI. Sexually active people, who perform various sexual activities like vaginal, anal and oral intercourses, can move microbes from bowel or vaginal cavity to urethral opening leading to UTI. It has been found that following sexual intercourses most women have significant number of bacteria in their urine. Use of catheters or tubes interfere with body's ability to clear microbes from urinary tract [3] and thus results into UTI. Use of family planning devices also make a person prone to UTI. Spermicides irritate mucosa increasing the risk of bacteria invading the surrounding tissues. Diaphragms slowdown the urine within the urinary tract, condoms cause trauma to vaginal wall during sexual intercourses and thus allows the bacteria to attach to the traumatized membrane and causes the infection.

In spite of development of various advanced techniques for the diagnosis of diseases, urine microscopy, urine dipstick to detect leukocytes esterase and urine culture remain the main diagnostic tests to diagnose UTI. The culture of midstream urine is still the Gold Standard test for the diagnosis of UTI. Requesting for a urine culture test still remains a joke in poorly established laboratories where laboratory infrastructure and availability of skilled microbiologists are always a problem to report cultural findings. So in order to avoid such problems, this retrospective study compares the microscopic findings with the cultural findings and the findings are compatible. The aim of this study is to encourage clinicians to send urine for microscopy if hospital set up, patient's economical status and urgency of reports do not support cultural findings of the samples.

METHODOLOGY:

The study was conducted in the department of Microbiology, Nobel Medical College and Teaching Hospital, Biratnagar. Midstream urine samples submitted

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for bacteriological diagnosis were inoculated in CLED, cysteine lactose electrolyte deficient agar plates, an ideal culture media for the isolation of urinary pathogens causing UTI. Two samples from two different patients were inoculated in a single culture plate. Standard loop of internal diameter of 3.26 mm made up of nichrome of 28 SWG was used for inoculating the plates. Such wire loop carries 0.004 ml of urine and if growth occurs it will give significant bacteriuria of > 10^5 CFU (colony forming unit)/ml [4].

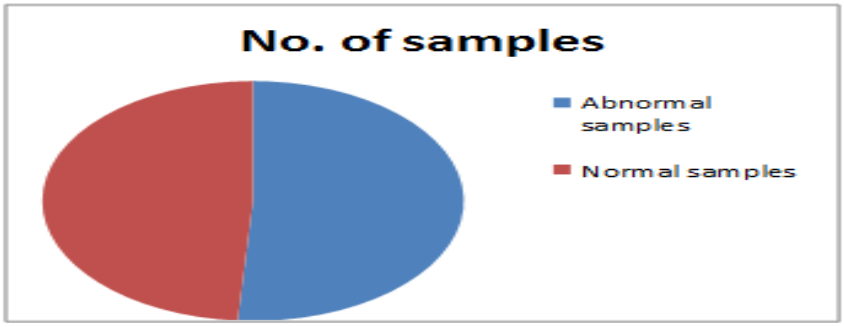
After the sample was inoculated into the culture medium, the sample was mixed thoroughly and 50µl of it was aspirated with a micropipette and dispensed on to a clean glass slide. Then a cover slip of a standard dimension of 22x22x0.1mm was put on it. The smear was screened under 40x High Power Field (HPF). Under these conditions, the area of one HPF will be about 0.15mm^2 and the volume of the urine observed in an HPF will be about 0.015mm^3. In this situation finding of one pus cell in 7 HPF corresponds with 10^4 pus cells /ml of urine and the finding of clearly larger numbers than this indicates significant pyuria[5]. The number of pus cells found was noted.

The next day the growth in the culture plates were noted down. If no growth had occurred then the culture was reported as "Culture sterile after overnight incubation aerobically at 37^0 C."If more than 2 different types of bacterial growth were seen, then patients were requested to submit another sample taking precautionary measures to avoid contamination of samples by normal flora. If the colony count was more than 400, such samples were processed further for the identification of the causative agents and for the antibiotic susceptibility test (AST).

RESULTS:

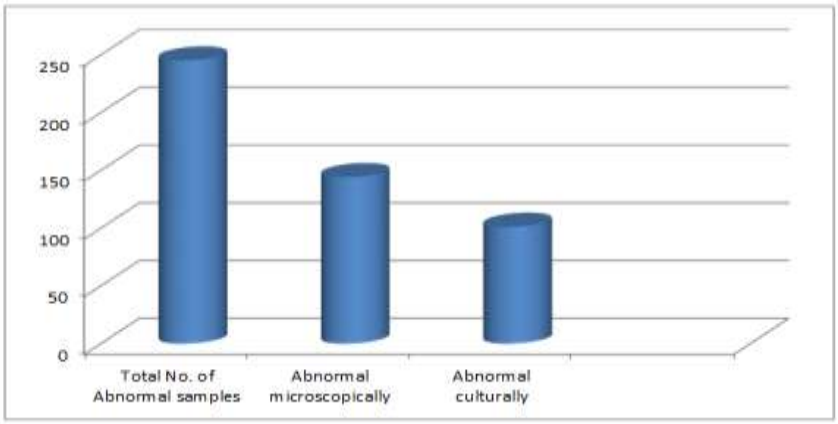
Total number of 600 samples was analyzed both microscopically and culturally within 2 months of the study period. Out of 600 samples 293 samples (48.8%) were normal in both microscopy as well as in the culture which is shown by the Fig 1. One hundred and forty-four samples came out to be microscopically abnormal but no growth was seen in the culture plates that means 24% of the samples revealed presence of pus cells though they were sterile in culture. Whereas there are only 20 samples which were normal microscopically but they came out to be positive in culture ie only 3.33% samples were abnormal culturally though they were normal microscopically. Of all 245 samples which were abnormal both microscopically as well as by culture methods (Contaminants and insignificant growth excluded), 144 samples ie 58.8% of the total abnormal samples were abnormal microscopically but only 101 samples ie 41.2% of the total samples were abnormally by culture method which is shown in the Fig 2

Figure 1:



Ratio of Culturally and Microscopically abnormal samples:

Figure 2: Ratio of samples abnormal by microscopy and culture



DISCUSSION:

UTI is one of the commonest infections that affects all group of people, women and especially pregnant women are more prone to UTI. When UTI occurs, it is more likely to travel to kidneys. About 4-5% of pregnant women develop UTI. Hormonal changes and shift in the position of urinary tract during pregnancy make it easier for bacteria to travel up the ureters to kidneys and cause the infection[6]. For women life time risk of having UTI is greater than 50%[2]. Many women suffer from frequent UTI. About 20% of young women with first UTI will have recurrent infection[7]. With each UTI , the risk that a women will continue having recurrent UTI increases[8].

As compared to females, males are less likely to have a first UTI, but once he suffers from UTI, he is likely to have another because bacteria can hide deep inside prostrate tissues. Research funded by NIH suggests that one factor behind recurrent UTIs may be the ability of bacteria to attach to cells lining urinary tract[9].

Much hospital set up in developing countries like Nepal; do not have adequate physical infrastructure and skilled man power to do the urine culture to diagnose UTI. Going for urine culture is again a costly technique though it is a gold standard technique for the diagnosis of UTI. Many poor patients of our country, who barely gets 2 meals a day, cannot afford such costly techniques for the diagnosis of their ailments. So in context to all these factors urine for microscopy alone can be useful test for the diagnosis of UTI. But clinicians must bear in mind that UTI alone is not responsible for Pyuria.

Positivity of urine samples submitted in Nobel Medical College and Teaching Hospital's Microbiology lab

Is 16.82 %, the rest 83.18% samples came out to be negative. This result is comparable with the results of other studies. Between 70-80 % urine cultures were found to be negative for infection, making urine culture practice costly and time consuming[10]. So at least microscopy urine samples can be employed as screening technique to rule out UTI. Under a standard practice by using a standard microscope, a skilled technician can reveal a case of UTI if he happens to see more than one us cells in 7 HPF of uncentrifuged urine. This will greatly decrease the laboratory cost and at the same time it will help to reduce work burden of overloaded Microbiology Lab. Apart from urine microscopy , other techniques like dipstick techniques which detects leucocyte esterase enzymes in urine of suspected case of Pyuria, can also be employed. But still the comparison of urine microscopy and urine dipstick testing using bacterial colony count and urine culture showed no significant differences between the two methods[11]. So for underprivileged patients, whose poor economical status and settlements away from well equipped medical lab, a good microscopy alone can be a boon for diagnosis of UTI. But microscopy alone can be relied upon for treatment of patients with appropriate antibiotics. For this one needs to culture the urine sample, perform various biochemical tests for the identification of the organism and do antibiotic sensitivity test to find out which antibiotics are suitable to prescribe to that particular patient.

ACKNOWLEDGEMENTS:

The author is greatly indebted to all the faculties and staff of the department of Microbiology and to his wife Mrs Durga Devi Chaulagain, daughter Miss Neeharika Parajuli and son Mr Aakash Krishna Parajuli for their continuous help in bringing up this article.

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