ROLE OF BACTERIURIA AND PYURIA IN URINARY TRACT INFECTION OF SELECTED SUBJECTS OF TAMILNADU, SOUTH INDIA

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ABSTRACT

Urinary tract infection is not much complicated which occurs commonly in both the genders . It is caused by the uropathogenic bacteria, usually Escherichia coli, *enters into the urinary tract via bladder and defeats the immunity. Analyzing the presence of microorganisms in the urinary tract, compares bacteriuria or urinary tract infections (UTI), this study was conducted to assess the values for bacteriuria and pyuria and evaluate to go for the treatment. A total of 500 urine samples recorded data were obtained which were analysed by simple randomized method from the laboratory of the Govt. hospital Nagapattinam, Tamilnadu. Urine cultured values were compared with normal urine microscopy profiles of positive and negative predictive values of the findings of urine analysed datas were segregated. 350 (70%) of the cases were females. 55.7 % (159/500) of patients had positive urine cultures. The most prevalent cultured micro-organism was E. coli (61.2 %). Sensitivity, specificity, positive and negative predictive values of microscopic pyuria was 84%, 85%, 48%, 95 %, respectively. As the same for bacteriuria, these calculations were 80%, 97%, 93%, 94% and for the category with both bacteriuria and pyuria were 82%, 99%, 95%, 97%, respectively. According to the results, it is concluded that the urine microscopy features seems to be useful to exclude the presence of infection if the results of both bacteriuria and pyuria are negative, but positive test results have to be confirmed.*

Keywords: *Urinary Tract Infection; Bacteriuria; Pyuria*

INTRODUCTION

Urinary tract infections are caused when microbes manage to get past the body immunes. The majority of UTI cases are caused by the bacterium Escherichia coli (E. coli) usually found in the digestive system. Chlamydia and Mycoplasma bacteria can infect the urethra but not the bladder. The urinary tract infection to the major structural segment involved such as urethral infection, bladder infection, ureter infection and kidney infections. Other structures that eventually connect to or share close anatomic proximity to the urinary tract (for example, prostate, epididymis, and vagina) is sometimes included in the discussion of UTI because they may either cause or be caused by UTI. [1] Technically, they are not UTIs and will be briefly mentioned in this article. UTI are not transmitted from person to person, other investigators dispute this and say UTI may be contagious and recommend that sex partners avoid relations until the UTI has cleared. [2]There is general agreement that sexual intercourse can cause a UTI. This is mostly thought to be a mechanical process whereby bacteria are introduced into the urinary tracts during the sexual act. There is no dispute about the transmission of UTI caused by sexually transmitted disease (STD) organisms. The incidence is obviously more in women because of the anatomical differences in females. Except during the first few months of life, females are far more susceptible than males to UTI. Bacteriuria is more common with in-creasing age. For elderly women living in the community, UTIs compromise the second most common infection, whereas in residents of long-term care facilities and hospitalized subjects, it is the number one cause of infection. Pyuria is typically caused by certain illnesses and disease affecting the urinary tract or kidneys. Some of the more common infections that lead to Pyuria are urinary tract infections, both upper and lower.[3] Upper urinary tract infections affect the kidneys and ureters, whereas lower urinary tract infections affect the bladder and urethra.

Asymptomatic bacteriuria is the presence of bacteria in the urine at a concentration greater than 10^8 colony forming units (CFU)/L in an individual without signs or symptoms of a urinary tract infection (UTI). [4] Normally, urine does not contain any microorganism. The presence of any microorganism in the urine may lead to the development of UTI. Some people, especially women, may have bacteria in the urine and develop a UTI itself, being completely asymptomatic. These cases are called "asymptomatic bacteriuria" and are of particular importance in pregnant women, as we will comment further. An extremely important factor in the development of UTI is urinary stasis. This happens when there is a difficulty emptying the bladder, and if urine accumulates for a long time. [5] This favours the proliferation of bacteria in the urine, leading to the development of infection. Most of the people asymptomatic bacteriuria has not been shown to be harmful. Urine analysis is one of the most important tests in clinical laboratories for diagnosis, screening and prevention of UTI. The presence of bacteria and WBC is important for diagnosis, screening and prevention of UTI. Presence of any bacterium in microscopic study defined as bacteriuria and presence of more than 3 WBC in high-power field microscope defined as Pyuria. Thus, the objective of the study is to evaluate, positive and negative predictive value for two parameters Bacteriuria and Pyuria suggests Urinary Tract Infections.

MATERIAL AND METHODS

The present study was analysed from the recorded data of UTI infected subjects on 500 urine samples that were collected from central laboratory of govt hospital Nagapattinam, Tamilnadu. As per the confirmation from the lab chief that the Samples were collected with systematic randomized sampling method. Those referred urine samples to the laboratory in two specific days of the week during the study period, which has both urine analysis and culture results defined as inclusion criteria. They collected the Urine samples from the cases early in the morning or several hours after having meal according to standard techniques. In the first step of microscopic evaluation, 10 ml of urine sample was centrifuged at 2500 - 3000 rpm for 5 minutes. After centrifuge supernatant was removed. Then one drop of sediment was placed onto the microscope slide, covered and examined using light microscope under 40x magnifications. Any bacteria (0 - 4) was defined as bacteriuria and leukocyte more than 3 - 5 in one high power field was defined as pyuria. Urine sample was taken with calibrated sterile inoculating loops and fractioned on the surface of two plates; a blood agar base and a McConkey agar by streak method. Plates were incubated for approximately 24 hours at 35˚C - 37˚C. If there were no growth occurred after first time incubation they were further incubated 24 hours. Therefore, no growth after 48 hours was reported as negative.

STATISTICAL ANALYSIS

Statistical analysis was done using suitable statistical tool. Data was estimated on excel sheet and analysed statistically. Quantitative data was summarized in the form of MEAN ± SD and differences in mean of both the groups were analyzed using Student's unpaired t-test to calculate the sensitivity, specificity and predictive values for pyuria and bacteria, separately or in complementation which was described with the 95% Confidence Interval. Among the 500 urine samples which were analyzed, 350 (70%) were adopted from female patients and 38.2% were for male patients which belonged to 6 ranges of age from less than 1 year old to more than 60 years old (Table 1). All of them have both the result of urine culture and urine microscopy. Thirteen percent (350/500) of patients had positive urine cultures. Among the cultures with microbial growth, 55.6% (195/350) were observed in females. The prevalence of microorganisms cultured samples was Escherichia coli (54.2%; 190/350),Enterobacter spp. (26.6%; 195/350), Shigella spp. (5.9%; 9/350), Proteus and Klebsiella spp. had the same prevalence (08%; 12/350) and the remained 4.2% were other species such as Serratia spp. and Citrobacter spp. Sensitivity, specificity, positive and negative predictive values are microscopic pyuria were 84%, 85%, 48% and 95% respectively. As the same for bacteriuria, these calculations were 96%, 97%, 87% and 97% and for the category with both bacteriuria and pyuria were 80%, 97%, 93%, and 94%.

SUMMARY

170 patients were positive for bacteriuria or pyuria.120 patients were positive for pyuria which 145 cases.(50.1%) had positive urine culture. 176 patients were positive for bacteriuria which 246 (85.6%) had positive urine culture. 110 patients were both positive for bacteriuria and pyuria which 102 cases (94.1%) among them had positive urine culture (Table 2. The sensitivity, specificity, predictive values (positive and negative) for the parameters analyzed as predictors of UTI in this study was shown in (Table 3).

Table 1 urinary tract infection age wise

Age group	Positive	Negative	Total (%)
1-10	35 (23.3%)	95(27.5%)	130 (26%)
10-20	32(21.3%)	82(23.4%)	114((22.8%)
21-30	21(14%)	67(19.1%)	88(17.6%)
30-45	19(12.6%)	54(15.4%)	73(14.6%)
46-60	31(20.6)	39(3.71%)	70(14.0%)
>60	12(08%)	13(2.28%)	25(05%)
Total	150 (30%)	350 (70%)	500(100%)

In our study most of positive results were females (69.2%) which confirms findings of previous studies. The main reason is because of anatomical and physiological differences between two sex [6]. In this study *Escherichia coli* was isolated from 60.7.3% of cultured samples that is the most frequency among all ages. This result was approximately similar to the findings of Nys *et al.* who reported 66% in Netherlands [7]; but Koeijers et al. reported the rate of 48% . In that study all samples were obtained from male patients who had more than 21 years old. In another study which conducted on children also *Ecoli* has 60% prevalence rate . In our study Enterobacter and shigella were in second and third place whereas in results of two studies in Netherlands and Brazil, proteus and klebsiella were in similar rank. Maybe this variation is because of obvious discrepancy level of hygiene among two countries [8]. It must be noted that despite of low prevalence of Staphylococcus Saprophyticus, mentioning in different studies, it is an invasive microorganism often affecting the upper urinary tract, with a high probability of recurrent infections [9]. Urinalysis is a high-value procedure which requires specific labor. However, urinalysis parameters are still widely obtained to guide empirical treatment of UTI. One of the parameters which evaluated in urinalysis is pyuria. Pyuria defined as unusual presence of polymorpho nuclear leukocytes in urine, indicates that an inflammatory response is occurring somewhere in the urinary tract. Although pyuria is the most prevalent manifestation of UTI; other important conditions must be considered such as: pregnancy, fever and administration of corticosteroids [10]. According to this point, history taking is so important, especially in women. In our study history was not taken and it seems the main weakness of study. Another point is that sensitivity of pyuria in detecting enterococcus and yeast infection is lower than that for gram-negative bacillus.

DISCUSSION

It is well known that the sensitivity of a test is the proportion of true positive results detected by the test, while specificity is the proportion of true negatives detected [11,12]. According to our findings among sample population, urine microscopy on the basis of pyuria or bacteriuria was able to diagnose 79% - 89% of the patients. On the other hand, except in the testing by pyuria which had the specificity rate of 85%, urine microscopy was able of 92% screening among non-patient cases. As the same for predictive values, PPV and NPV are defined as the proportion of positive and negative tests that are confirmed as detecting or excluding disease, respectively. Findings of our study indicated that except in the case of pyuria which was 48% for PPV, in other conditions were calculated more than 95%. if the urine culture reference standard is set higher, the NPV will increase, but more numbers of infections will be missed [13,14]. The precision of predictive values is dependent on the sample size and use some kind of interval estimate appropriately. In present study we tried to pay extra attention to this point in contrast to others with the same objectives by choosing an appropriate deal sampling size and estimating 95% CI in re-porting diagnostic values which could be better support to our findings. In this study NPV was 97% in all cases that is strong for a diagnostic test, and bring up property of these tests in determination of urinary health. In the other word, in urinalysis if confidently there is no pyuria or bacteriuria. We could confirm that there is no UTI. This point is important for health care system as a view of cost effectiveness.[15] Because routinely those cultures which being ordered for confirmation of negative tests and not few in quantity, would be cut down. Therefore 1567 patients in this study did not require to be ordered for further urine culture, because of their normal urine analysis. Moreover than exclusion of infection, establishing of that is critical in health care. The presence or absence of pyuria is not helpful in establishing the diagnosis in older patients. However, the presence of pyuria is not a valid diagnostic criterion for infection. So as for nitrite and leukocyte esterase, which their results have more diagnostic if being together, the same is true for urine microscopy parameters. Deville *et al.* meta-analysis results, confirmed that dipstick individually, can rule out infection in population, if both nitrite and leukocyte esterase are negative. In this condition, sensitivities of the combination of both tests vary between 68% to 88% in different populations; although positive results have to be confirmed by other methods [6].In most studies one diagnostic test is not reliable for confirmation of UTI, New technological evolutions have enabled new diagnostic

approaches in urinalysis such as urinary flow cytometry and automated microscopic pattern recognition [27] but such approaches needed more studies to evaluate benefits and cost effectiveness aspects of them. Researches in this field can be improved if inclusion and exclusion criteria become explicit. Some other factors that affect accuracy are reporting on the distribution of micro-organisms, the way in which urine is collected, the time delay between collection and analysis, the handling of mixed cultures and contaminated urine samples, and who was reading the test, may improve future studies [6].

Table 2 Urinary culture analysis results

Category	Urine culture			Total
bacteriuria	positive	138	12	150
	negative	12	338	350
pyuria	positive	131	10	141
	negative	19	340	359
Pyuria and bacteriuria	positive	124	06	130
	negative	26	354	380

Table 3 Diagnostic assessment values

Urinary parameters	Sensitivity (95%)	Specificity (95%)	Positive (95%)	Negative (95%)
Bacteriuria	96(%)	97(%)	87(%)	97(%)
Pyuria	84	85	48	95
Pyuria and Bacteriuria	80	97	93	94

CONCLUSION

According to our results it can be concluded that absence of pyuria and bacteriuria simultaneously and the infection positive results need to be confirmed by advanced method. There are numerous and different factors such as procedure of collecting patients, sampling and performing tests, which would influence on results. Therefore, methodological quality of the studies and following standard protocols could improve the accuracy.

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