Relationship between pyuria and bacteruria in suspected urinary tract infection

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Abstract

Background: Urinary tract infection (UTI) is a serious health problem affecting millions of people each year around the world. It is a common cause of morbidity and can lead to significant mortality. It is the most common bacterial infection. Presumptive diagnosis of UTI is made by analysis of urine and is confirmed by urine culture. Pyuria is a good indicator of an inflammatory response. Presence of bacteriuria has a sensitivity of 40% to 70% and specificity of 85% to 95% . The prevalence of bacteriuria in young women is 30 times more than in men. One in five women develops a UTI during her lifetime. The prevalence of bacteriuria is more in female population with at least 10-20% of females experiencing a symptomatic UTI episode some time during their lifetime. However, with increasing age, the ratio of women to men with bacteriuria progressively decreases. At least 20% of women and 10% of men older than 65 years have bacteriuria. The aim of this study was to determine relationship between pyuria and bacteriuria in patients with suspected UTI at NU hospital.

Method: 500 urine samples obtained in NU hospital from the patients without prior antibiotic treatment suspected with UTI were included in this study. Paediatric patients were excluded. Microscopic examination as well as culture and identification were performed by using standard bacteriological techniques.

Results: Out of 500 samples obtained, 104 samples showed significant growth of pathogens. As number of pus cells in urine increased the chance of getting culture positive results were also high. Out of 260 samples with pyuria, only 100 urine samples showed significant bacterial growth. Out of 240 samples without pyuria, only 4 samples showed significant bacterial growth.

Key words: Urinary tract infection, Pyuria, Bacteriuria, culture and sensitivity, Mid-stream urine.

Introduction

UTI is the most important cause of mortality and morbidity in the world[1]. It is more common in women than men. The prevalence of bacteriuria is more in female population with at least 10-20% of females experiencing a symptomatic UTI episode some time during their lifetime[2,3]. The most widespread reference method for UTI diagnosis is conventional urine culture with no less than 100,000 colony forming units per millilitre. The diagnostic accuracy of microscopic urine analysis for suspected UTI has been studied extensively but results of this investigation have varied depending on patient population and laboratory techniques.

Materials and methods

Standard laboratory procedure and technique was followed for sample collection i.e. clean catch mid-stream urine samples were collected in sterile universal container from 500 patients. Specimens were cultured as per the standard operating procedure manual with a 0.01ml calibrated loop on cysteine lactose electrolyte deficient medium (CLED) and incubated at 35-37⁰c aerobically for 18-24 hours. For microscopic analysis, centrifuged sediment of urine sample was examined for white

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blood cells per high powered field (HPF) and was compared with urine culture reports. The isolates were identified using BD phoenix.

Definition

A positive urine culture was defined as pure growth of urinary tract pathogen of growth more than 100,000 CFU/ml of urine considering clinical history of patients. Cultures with no growth (< 100cfu/ml) or growth of < 500 cfu/ml was considered negative. And mixed growth of organisms more than two types were considered as contaminants. Significant pyuria was defined by presence of > 5 WBCS / HPF[4,5].

Results

During this study out of 500 urine samples examined, 104 were positive for bacterial cultures, out of which 35 were females and 69 were male patients. Escherichia coli was the most common organism isolated, followed by enterococcus faecalis, Klebsiella pneumoniae, Staphylococcus aureus, Proteus mirabilis, and Non Candida albicans [Table 1-4].

Table 1. Distribution of pyuria and bacteriuria

No. of pus cells	No. of samples	Culture positive	Culture negative	Contaminants	Mixed growth
1-5	240	4 (1.6%)	232 (96.6%)	---	4 (1.6%)
6-10	70	16 (22.8%)	52 (74.2%)	---	2(1.4%)
11-15	50	12 (24%)	36 (72%)	---	2 (4%)
16-20	30	16 (53.3%)	12 (40%)	---	2 (6.6%)
Plenty	110	56 (50.9%)	38 (34.5%)	06 (5.45%)	10 (9.09%)

Table 2. Pyuria and Bacteruria in male and female patients

No. of pus cells	No. of samples	MALE				FEMALE			
		Culture positive	Culture negative	Mixed	Contami--nants	Culture positive	Culture negative	Mixed growth	Contami--nants
1-5	240	2	172	1	-	2	60	3	-
6-10	70	9	38	2	-	7	14	-	-
11-15	50	2	25	-	-	10	11	2	-
16-20	30	8	8	-	-	8	4	2	-
Plenty	110	48	18	05	-	8	20	05	06

Table 3. Pattern of pyuria (5 per HPF) of urine sediment against the number of samples showing significant bacteriuria.

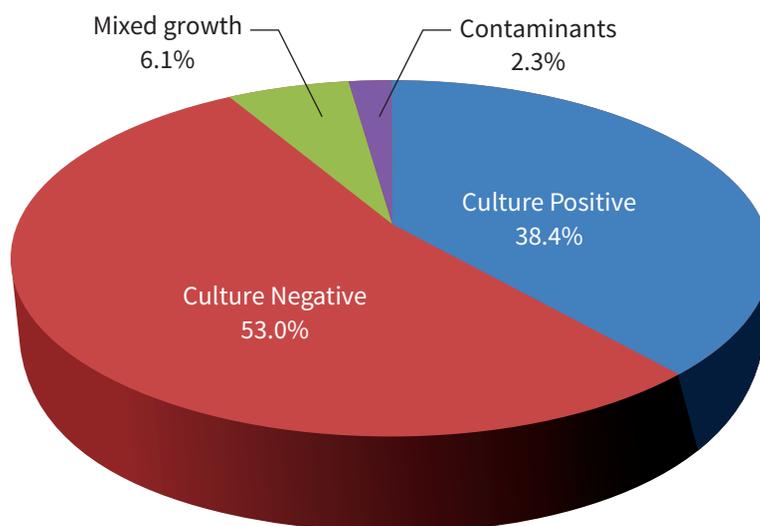| Pyuria	No. of Samples				
	Culture Positive	Culture Negative	Mixed growth	Contaminants	Total
Male	67	89	7	-	163
Female	33	49	9	6	92
Total	100 (38.4%)	138 (53.0%)	16 (6.1 %)	6 (2.3%)	260

Graph 1

Figure 1. Pattern of pyuria (5 per HPF) of urine sediment against the number of samples showing significant bacteriuria.

Only 38.4% of pyuria showed significant bacteriuria. However there was no significant difference (P>0.05) found in male and female.

Table 4. Predictive value of positive and negative samples

	TP	FP	Total	Proportion value
Positive for pyuria	TP 100	FP 160	Total 260	Proportion value 38.46
Negative for pyuria	TN 236	FN 4	Total 240	Proportion value 98.33

38.46 is false positive. 98.33 is true negative

Discussion

Out of 260 urine samples with pyuria, only 100 (38.4 %) samples showed significant bacterial growth . Out of 240 urine samples without pyuria, 4 (1.6%) urine samples showed significant bacterial growth.

In the present study, pyuria (>5 WBCs /HPF) was detected in 240 specimens. However only 100 specimens were culture positive. This suggest that pyuria alone cannot be used for detecting bacterial pathogen in patients with significant bacteruria[6]. Macdermott concluded that there was no correlation between degree of pyuria and a significant urine culture. Further, Bachman et al in 1993 concluded that pyuria on urine microscopy was poor in identifying asymptomatic bacteruria[7].

Goossens H et al reported that asymptomatic bacteruria cannot be accurately predicted by microscopic examination. Wammanda et al[8] found

positive urine culture with significant bacteria in 24.3%, urine microscopy for significant leucocyturia had a sensitivity of 51.1% . On the other hand Shaw et al reported that urine WBC count was sensitive in detecting UTI [9].

Our study showed as the number of pus cells increased per HPF, the chance of getting culture positive was also high. In this study, criteria for pyuria (5 or > 5 pus cells/HPF) was made according to Stamm, Wright [10,11]. Out of 260 samples without pyuria, 4(1.6%) urine samples showed significant bacterial growth. Likewise, out of 240 samples with pyuria, only 100 (38.4%) samples showed significant bacterial growth.

Our findings of pyuria and without pyuria versus significant growth were obtained in accordance with National Guideline Clearing house (NGC) which has mentioned microscopic examination of pyuria has a sensitivity of 80-90% and a specificity of 50%

for predicting UTI and urine culture has a sensitivity of 50% [12].

Conclusion

Altough pyuria and significant bacteriuria may not always correlate in suspected case of UTI; however as the number of pus cells in the urine increases, the chance of getting culture positive results is also high. Microscopic examination prior to culture is also important for correlating pyuria and bacteruria. Low count of bacteria should also be considered as significant for symptomatic patient with the pyuria. Pyuria with sterile culture should be tested for other slow growing organisms as well as fastidious organisms.

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