Original Article

Correlation of Bacteriuria and Pyuria among the suspected cases of Urinary Tract Infection in Kathmandu University Hospital

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Abstract

Introduction: Infection of urinary tract is one of the most important infectious diseases in the world affecting all age groups across the life span. Bacteriuria and pyuria being some of the features of urinary tract infection need to be correlated. The objective of the study is to determine correlation of bacteruria with pyuria in suspected urinary tract infection.

Methods: This study was conducted at Kathmandu University Hospital, Dhulikhel between September 2014 to March 2015. During this period, 272 urine samples were collected and analyzed by microscopic examination and semi-quantitative culture technique with standard microbiological methods.

Results: A total of 272 urine samples were processed in which 78(28.67%) were culture positive. Among culture positive samples significant bacteriuria (i.e. $\geq 10^5$ CFU/ml) was detected in 65(83.3%) of the cases whereas 13(16.7%) of the culture positive samples showed low count significant bacteriuria (i.e. 10^4-10^5 CFU/ml). Out of 58 urine samples with significant pyuria, 48(82.75%) were culture positive. Among 214 urine samples without significant pyuria, 30(14.01%) urine samples were culture positive which was significant (P value<0.05).

Conclusion: The study showed that pyuria and bacteriuria had no correlation in the suspected cases of urinary tract infection. According to our findings, it is necessary to culture urine and also perform microscopic examination for the correct laboratory diagnosis of urinary tract infection.

Keywords: urinary tract infection, culture, bacteriuria, pyuria, microscopy

Introduction

The infection of urinary tract is one of the commonest problems among Nepalese population.[1] About 150 million people develop a urinary tract infection each year and the most common cause of infection is *Escherichia coli*, though other bacteria or fungi may rarely be the cause. Risk factors include female anatomy, sexual intercourse, diabetes, obesity, and family history.[2] Urinary tract infections (UTIs) are one of the most common infectious diseases ranking next to upper respiratory tract infection. UTIs are often associated with significant morbidity and mortality.[3]

Urinary tract infections are spectrum of disease caused by microbial invasion of the genitourinary tract that extends from the renal cortex of the kidney to the urethral meatus.[4] The presence of pyuria and bacteriuria are two most important indicators of urinary tract infections.[5] Bacteriuria is defined as the presence of $>10^5$ colonies of a single pathogen per milliliter of urine.[6] A more current definition is the presence of as few as 10^3 CFU/ml in symptomatic patients or when a specimen is obtained by sterile catheterization.[7] Pyuria is defined as the presence of white blood cells (WBCs) in a person's urine.[8]

In case of asymptomatic patients with diabetes, enteric fever or bacterial endocarditis, bacteriuria without pyuria may occur.[9] Pyuria with a sterile routine culture may be found with renal tuberculosis, gonococcal urethritis, *C. trachomatis* infections and leptospirosis.[10] Pyuria can occur in the absence of apparent bacterial infection, particularly in patients who

have already taken antimicrobials, calculus disease, stricture, neoplasm and glomerulonephropathy. In female patients, pyuria can occur due to leucorrhea, fever, pregnancy and administration of adrenocortical steroids without infection.[11] This study was performed to identify the correlation between pyuria and bacteriuria among suspected cases of UTI.

Methods

This study was conducted at Kathmandu University Hospital, Dhulikhel between September 2014- March 2015 among suspected UTI patients including inpatients as well as outpatients. Ethical clearance was obtained from Institutional Review Committee of Kathmandu University Hospital.

A total of 272 clean catch mid-stream urine samples were collected after obtaining informed consent from the patients. Specimen collection, culture, identification tests were done according to the guidelines.[12] 10-15ml of urine sample was collected in a sterile centrifuge tube and centrifuged at 5000 rpm for 5 minutes. The supernatant was discarded. The sediment was then examined under the microscope for the presence of pus cells. Pus cells of >5/HPF were considered as significant. Urine culture was done on Blood agar and MacConkey agar plates according to the standard laboratory methods.[12] Culture plates were observed for bacterial growth after 18-24 hours of incubation at 37^0C aerobically. Identification of the bacteria was based on colony morphology, Gram stain and biochemical reactions. Bacterial colonies $>10^5$colony-forming units per ml of urine were considered as significant. Data were analyzed by (SPSS) version 11.5 software and P value less than 0.05 was considered to be significant.

Results

Of 272 patients from whom urine sample were collected, 147 were females and 125 males. Among 272 samples, 13 (4.78%) samples showed low count significant bacteriuria and 65 (23.89%) showed significant bacteriuria.

Among 272 urine samples, 58 (21.32%) showed significant pyuria, 45 (16.54%) showed insignificant pyuria and 169 (62.14%) had no pus cell.

Out of 58 samples with significant pyuria, 48 (82.75%) were culture positive, while 30 (14.01%) out of 214 with no significant pyuria were culture positive as shown in table 1. Pyuria and bacteriuria was correlated statistically (P<0.05).

Table 1: Distribution and correlation of pyuria with culture results

Pyuria	Culture positive (%)	Culture negative (%)	Total(%)
Significant (>5WBC/HPF)	48(82.75)	10 (17.25)	58(21.32)
No significant pyuria (≤5WBC/HPF)	30(14.01)	184(85.99)	214(78.67)
Total	**78(28.67)**	**194(71.33)**	**272 (100)**

The highest culture positivity, 18(94.73%) samples out of 19 was detected in urine samples having pus cells of 6-10/hpf, whereas 6(66.66%) urine samples with more than 50 pus cells/hpf was culture positive as shown in table 2.

Table 2: Comparison between pyuria and bacteriuria from cases of UTI

Pus cells /hpf	No of samples	Culture positive(%)	Culture negative (%)
0	168	20(11.90)	148(88.10)
1-5	46	10(21.74)	36(78.26)
6-10	19	18(94.73)	1(5.27)
11-20	16	12(75)	4(28)
21-50	14	12(85.71)	2(14.29)
>50	9	6(66.66)	3(33.33)
Total	**272**	**78(28.67)**	**194(71.33)**

E. coli was the commonest bacterial isolate 64(82.05%), and 40(62.5%) of urine with *E. coli* isolate showed significant pyuria whereas 9(14.06 %) of urine with *E. coli* isolate showed insignificant pyuria and 15(23.43%) showed no pyuria. This was followed by *K. pneumoniae* isolate 8(10.25%). Only 1(1.28%) each of *S. aureus, S. saprophyticus* and *E. faecalis* isolates were detected but out of this, urine with *S. aureus* isolate did not show significant pyuria as shown in table 3.

Table 3: Significant and insignificantpyuria causing bacterial organisms

Organisms	Significant pyuria (%)	Insignificant pyuria (%)	No pyuria (%)	Total
E. coli	40(62.5)	9(14.06)	15(23.43)	64
K. pneumoniae	4(50)	1(12.5)	3(37.5)	8
P. vulgaris	1(50)	0(0)	1(50)	2
P. aeruginosa	1(100)	0(0)	0(0)	1
S. aureus	0(0)	1(100)	0(0)	1
S. saprophyticus	1(100)	0(0)	0(0)	1
E. faecalis	1(100)	0(0)	0(0)	1

Discussion

In our study correlation between pyuria and bacteriuria from suspected patients in Kathmandu University Hospital was determined. Overall 65 (23.89%) showed significant bacteriuria. Other researchers also found similar results.[13, 14]

Low count significant bacteriuria (10^4-10^5 CFU/ml) was detected in13(4.78%) samples. The reason for this may be because of prior antibiotic treatment, sample collected from Foley's or indwelling catheter etc.

In this study, 82.75% (48/58) samples with significant pyuria showed culture positive result which was much higher compared to the study conducted by Kattel *et al.,* in which 53.9% urine samples showed significant bacterial growth with significant pyuria.[9] The correlation between pyuria and bacteriuria was found to be statistically significant ($P<0.05$). According to the previous information, bacteriuria without significant pyuria often occur in cases of asymptomatic patients, diabetes patients, patients with enteric fever or bacterial endocarditis whereas significant pyuria with sterile bacterial culture occur in patients with prior antibiotic use, renal tuberculosis, corticosteroid administration, analgesic nephropathy, renal calculi or in the presence of bacteria that are not able to grow in the media used.[9]

In this study, the significant bacterial growth was found to be high (94.73%) in samples with 6-10 pus cells per hpf, which is similar finding with the study conducted by Dhakal *et al*.[15]

On the basis of organism that were isolated, *E. coli* was the commonest bacterial isolate 64(82.05%), and 40(62.5%) of urine with *E. coli* isolate showed significant pyuria whereas 9(14.06 %) of urine with *E. coli* isolate showed insignificant pyuria and 15 (23.43%) showed no pyuria. This was followed by *K. pneumoniae* isolate 8(10.25%). Only 1(1.28%) each of *S. aureus, S. sprophyticus* and *E. faecalis* isolates were detected but out of this, urine with *S. aureus* isolate did not show significant pyuria which is quite similar to the finding in the study conducted by Anjila *et al* in which *E. coli* was the commonest organism with significant pyuria of 62.5% and insignificant pyuria of 13.54%.[16]

Conclusion

Culture positivity may not be found in majority of suspected patients with urinary tract infection. Pyuria and bacteriuria may not always correlate in the suspected cases of UTI, but the number of pus cells in urine can correlate with culture positivity. The study indicated that pyuria and bacteriuria had no correlation in the suspected cases of urinary tract infection. According to our findings, it is necessary to culture urine and also perform microscopic examination for the correct laboratory diagnosis of urinary tract infection.

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Conflict of Interest: None declared

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