

## Original Article



## Pyuria and Bacteriuria Correlation among Suspected Urinary Tract Infection in a Tertiary Care Centre in Lalitpur

Sweekrity Neupane<sup>1</sup>, Bijendra Raj Raghubanshi<sup>1</sup>, Ruchee Manandhar<sup>1</sup>, Rajni Lama<sup>1</sup>, Anamika Priyadarshinee<sup>2</sup>

<sup>1</sup>Department of Microbiology, KIST Medical College, Imadol, Lalitpur

<sup>2</sup>Department of Pathology, KIST Medical College, Imadol, Lalitpur

### ABSTRACT

**Introduction:** Urinary tract infection (UTI) is the most common bacterial infection. Pyuria and bacteriuria are two most important indicators of urinary tract infection. Presumptive diagnosis of UTI is made by microscopic examination of urine and is confirmed by urine culture. The aim of this study was to determine the relationship between pyuria and bacteriuria in patients with suspected UTI at KIST Medical College and Teaching Hospital.

**Methods:** A cross sectional study was carried out from January 2020 to January 2021 at KIST Medical College and Teaching Hospital. Thirteen hundred and twenty urine samples from patients with suspected UTI were included in this study. Processes for microscopic examination as well as process for culture and identification were performed with the use of standard bacteriological techniques.

**Results:** Of the 1320 urine specimen examined 202 (15.3%) samples showed growth of pathogens. Pyuria was seen in 537(40.68%) out of 1320 urine sample. Out of 537 urine samples with pyuria, 181 (33.7%) urine samples showed significant bacterial growth. As number of pus cells in urine increased, the chance of getting culture positive results were also high. Out of 783(59.32%) urine samples without pyuria, 21(2.7%) urine samples showed significant bacterial growth. It was found that there is significant correlation between pus cells and culture as  $p = 0.000 (< 0.05)$ .

**Conclusion:** Pyuria and significant bacteriuria may not always correlate in the suspected case of UTI. However, as the number of pus cells in the urine increases, the chance of getting culture positive result is high.

**Keywords:** Bacteriuria, Pyuria, Urinary tract infection

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**Correspondence:**

Dr. Sweekrity Neupane

Lecturer, Department of Microbiology,

KIST Medical College, Imadol, Lalitpur

Email: sweekritinep@gmail.com

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## INTRODUCTION

Urinary tract infection is caused by microbial invasion of the genitourinary tract that extends from the renal cortex of the kidney to the urethral meatus.<sup>1</sup> It is the most important cause of mortality and morbidity in the world.<sup>2</sup> 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.<sup>3</sup> UTI is the most common bacterial infection causing illness in females mostly in the developing countries like Nepal due to illiteracy, unhygienic conditions and lack of proper toilet facilities. They are always vulnerable to infections by various organisms.<sup>4</sup> According to the annual report published by Department of Health Services, Nepal 3,16,711 suffered from Urinary tract infection in the year 2015/2016.<sup>5</sup>

The presence of pyuria and bacteriuria are two most important indicators of urinary tract infections.<sup>6</sup> Bacteriuria is defined as the presence of  $>10^5$  colonies of a single pathogen per milliliter of urine.<sup>7</sup> 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.<sup>8</sup> Stamm has defined pyuria as the presence of at least eight thousand leukocytes per ml of uncentrifuged urine, which corresponds to five leukocytes per highpower field in a centrifuged sediment.<sup>9</sup>

Urinary tract infections can be community acquired or hospital acquired. Escherichia coli is the most common organism responsible for UTI in both community acquired and hospital acquired.

Klebsiella and Proteus are other responsible pathogens responsible in community acquired infection and in hospital acquired are Pseudomonas, Proteus, and Enterobacter.<sup>10</sup>

Presumptive diagnosis of Urinary tract infection is made by microscopic examination of urine and is confirmed by urine culture. Bacteriuria and pyuria being the features of urinary tract infection need to be correlated

## METHODS

This is a prospective cross sectional study and conducted at Kist medical college and teaching hospital. Ethical clearance was obtained from KISTMCTH Institutional Review Committee with IRC NO – 2076/77/18. Total 1320 Urine specimens of suspected UTI patients (both outpatient and inpatient) visited from January 2020 to January 2021 were taken as study population and census method was used to collect data using proforma as data collection tool. Both of validity and reliability of tool were ensured verifying with two content experts. Inclusion Criteria included all patients with suspected UTI above 18 years. Exclusion Criteria included patients under antibiotics and patients with stricture or neoplasms. Standard laboratory procedure and technique was followed for sample collection i.e. clean catch mid-stream urine samples were collected in sterile universal container. 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 35-37<sup>o</sup>C aerobically for 18- 24 hours. The isolates were further identified by colony

morphology and biochemical test also antibiotic sensitivity test was performed as per standard laboratory procedure. For microscopic analysis, centrifuged sediment of urine sample was examined for white blood cells per high powered field (HPF). In the study, criteria for pyuria ( $\geq 5$  pus cells/HPF) was made according to Stamm, Wright.<sup>11</sup> Then data was first entered in MS excel and later data analysis was done in SPSS vs. 21. Data were summarized in frequency distribution table presenting both in number and percentages. Chi-squared test was used to test the statistical association considering  $p < 0.05$  as statistical significant.

## RESULTS

During this study 1320 urine samples were collected in which 860 (65.2%) were female and 460 (34.8%) were male. (Table 1) Out of 1320 urine samples examined, 202 were positive for bacterial culture. Out of which 57 were male and 145 were female. (Table 2) Out of 1320 urine samples 537 urine specimen showed with pyuria ( $> 5$  WBCs /HPF). 537 (40.68%) urine specimen with pyuria 181 (33.7 %) samples showed significant bacterial growth. Out of 783 (59.32%) urine samples without pyuria, 21 (2.7%) urine samples showed significant bacterial growth. It was found that there is significant correlation between pus cells and culture as  $p = 0.000$  which is  $< 0.05$  (Figure 1)

Out of 202 isolates 151 isolates were *Escherichia coli* followed by *Klebsiella pneumoniae* (15) , *Enterococcus species* (10), *Candida albicans* (8), *Pseudomonas aeruginosa* (4), *Acinetobacter species* (3), *Non albicans candida* (3), *Citrobacter species* (3), *Klebsiella oxytoca* (2), *Staphylococcus*

*aureus* (2) and *Enterobacter* (1). Mixed growth which showed more than 3 organisms were seen in 109 urine samples.

## DISCUSSION

The study showed the relationship between pyuria and bacteriuria from patients with suspected UTI in Microbiology Department of KIST Medical College and Teaching Hospital. In the present study 1320 urine samples were examined and 202 (15.3%) were positive for bacterial culture. Pyuria ( $> 5$  WBCs /HPF) was detected in 537 (40.68%) out of 1320 urine samples. However, only 181 (33.7%) specimens were culture positive in specimen with pyuria. Culture positive was more in female (130) than in male (51). Culture positive is high in female may be due to high number of samples from female patient. In addition females are more prone to UTI because of shorter urethra than male. In a similar study conducted by Kattel et al. 53.9% urine samples showed significant bacterial growth with significant pyuria.<sup>9</sup> Another study also concluded that pyuria alone has inadequate diagnostic accuracy for predicting bacteriuria.<sup>12</sup> This suggest that pyuria alone cannot be used for detecting bacterial pathogen in patients with significant bacteriuria. Pyuria with sterile bacterial culture can occur in patients with prior antibiotic use, renal tuberculosis, corticosteroid administration, analgesic nephropathy, renal calculi or in gonococcal urethritis, *C. trachomatis* infections and leptospirosis.<sup>13</sup>

It was found that out of 783 (59.32%) urine specimen without pyuria 21 showed significant bacteriuria. According to Stenqvist K et al, significant bacteriuria may sometimes occur in the

absence of symptoms and pyuria in patients who subsequently develop symptoms of UTI e.g. in pregnancy. The detection of such asymptomatic bacteriuria is of value for there is good evidence of its association with the development of pyelonephrit. This study showed pyuria without bacteriuria and bacteriuria without pyuria in certain number of patients could be due to inclusion of all kinds of patients mentioned above. However in our study as the number of pus cells increased per HPF, the chance of getting culture positive were also high. Similar result was shown by Anushreet al.<sup>15</sup>

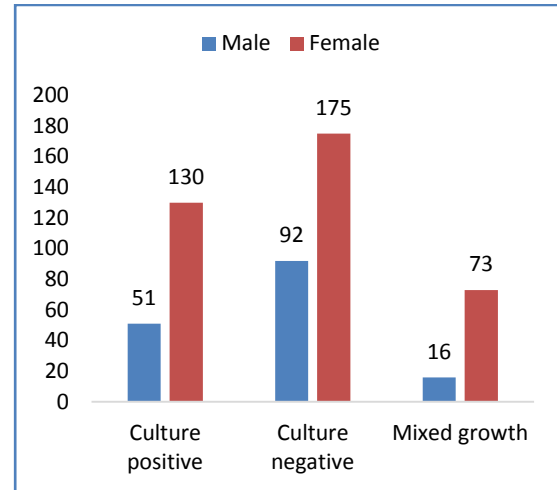


Figure showing Pattern of pyuria(>5 WBCs /HPF) of urine sediment against the number of samples showing significant bacteriuria (n=537)

Table 1. Pyuria and Bacteriuria in male and female patients

No. of pus cells	No. of samples	Female			Male		
		Culture positive	Culture negative	Mixed growth	Culture positive	Culture negative	Mixed growth
1-5	783	15	449	18	6	293	2
6-10	236	18	121	13	10	71	3
11-20	59	8	23	17	4	4	3
Plenty	228	96	30	43	32	17	10
Packed	14	8	1	0	5	0	0
Total	1320	145	624	91	57	385	18

Table 2. Distribution of pyuria and bacteriuria

No. of pus cells	No. of samples	Culture positive	Culture negative	Mixed growth
1-5	783	21 (2.7%)	742	20
6-10	236	28 (11.9%)	192	16
11-20	59	12 (20.3%)	27	20
Plenty	228	128 (56.1%)	47	53
Packed	14	13 (92.9%)	1	0
Total	1320	202	1009	109

## CONCLUSION

Pyuria and significant bacteriuria may not always correlate in the suspected case of UTI. Although pyuria and significant bacteriuria may not always correlate in suspected cases of UTI; however as the number of pus cells in the urine increases, the chance of getting culture positive result is also high. Microscopic examination prior to culture is also important for correlating pyuria and bacteriuria. Pyuria with sterile culture should be tested for other fastidious organisms like leptospira and Chlamydia causing urinary tract infections. Hence, the gold standard method for the diagnosis of UTI is urine culture.

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