

# Sociodemographic Pattern & Presentation of Sterile Pyuria: A single centre study

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## Abstract:

*In clinical practice, pyuria without evidence of urinary tract infection occurs in a clinically significant proportion of patients, particularly adult patients admitted for acute febrile illnesses. The finding of white blood cells in a urinalysis in the absence of bacteria (a sterile pyuria or a pyuria without bacteriuria) can be a diagnostic challenge. This study was aimed to determine the Sociodemographic pattern and presentation of sterile pyuria in patients attended at nephrology department of BSMMU. This cross sectional study was done in the department of Nephrology, BSMMU, during the period of September 2016 to August 2017. All patients of sterile pyuria aged more than 18 years regardless of the sex were included in the study. A total number of 246 cases who had urinary WBCs >5 per high powered field (HPF) with a negative culture were selected as sample by convenient sampling technique. It was observed that almost half (48.4%) patients belonged to age 41-60 years, 131(53.3%) were female, 147(59.8%) patients had completed graduate or above education, 97(39.4%) were house wives, 205(83.3%) were married and 174(70.7%) come from urban area. It was also observed that 139(56.5%) patients had swelling of the body followed by 87(35.4%) had oliguria, 79(32.1%) had fever, 51(20.7%) had dysuria, 42(21.4%) had low back pain, 115(47.7%) patients had diabetes mellitus, 113(45.9%) had hypertension, 67(27.2%) had CKD, 51(20.7%) had history of antibiotic use and 45(18.3%) had history of NSAID use, 171(69.5%) patients had normal temperature, 107(43.5%) & 160(65.0%) had no proteinuria & hematuria respectively, 167(67.9%) had urinary WBCd<sup>30</sup> / hpf, 176(71.5%) had normal total WBC count, and 98(39.8%) had no renal impairment in terms of serum creatinine. After evaluation we found that 81(32.9%) patients had glomerulonephritis, 40(16.3%) had interstitial nephritis, 30(12.2%) had history of treated UTI, 13(5.3%) had renal tuberculosis and 13(5.3%) was lack of follow up.*

*In conclusion, with the recent discovery of increasing numbers of antibiotic-resistant microbes, well-informed antibiotic choice is of great importance. A clinically significant proportion of patients have transient pyuria not associated with a urinary tract infection.*

**Key words:** Proteinuria, Hematuria, Glomerulonephritis, Treated UTI, Renal Tuberculosis.

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## Introduction:

Urinalysis is a test commonly ordered at admission to a hospital, especially when the

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patient has a febrile illness. In most cases it provides useful information, but it can sometimes be misleading. It has observed that patients admitted to the hospital with acute infectious illnesses unrelated to the urinary tract frequently have pyuria, which can confuse the admitting physicians. The finding of leukocytes in the urine suggests an infectious or inflammatory process involving the genitourinary tract, either directly or indirectly<sup>1</sup>. Although the differential diagnosis for sterile pyuria includes these processes, a number of other diseases can result in this finding.

However, the sociodemographic and common clinical presentation of pyuria in patients attended to the hospital had not been studied. Believing that more information about this

phenomenon might help physicians make better initial antibiotic choices, we undertook this study to estimate the incidence of pyuria at the time of hospital outdoor, to gather information that could help clinicians make better initial evaluation and treatment decisions in such cases.

Noninfectious, systemic diseases can also produce sterile pyuria. Patients with hypertension, especially malignant hypertension, can have sterile pyuria, usually with hematuria<sup>2</sup>. Systemic inflammatory diseases such as sarcoidosis and Kawasaki disease can produce pyuria without bacteriuria. More than a third of patients with cyanotic congenital heart disease have a glomerulopathy. Laboratory findings associated with this glomerulopathy include increasing creatinine, or an abnormal urinalysis resulting in proteinuria, hematuria, sterile pyuria, or casts<sup>3</sup>

Intrinsic renal pathology can also lead to pyuria without bacteriuria. Papillary necrosis, which can be caused by such diseases as chronic analgesic nephropathy, obstructive uropathy, sickle cell disease nephropathy, or diabetic nephropathy, can result in sterile pyuria<sup>4</sup>. Tubulointerstitial diseases such as interstitial nephritis, lupus nephritis, and renal transplant rejection can all lead to sterile pyuria. Drug reactions are a common cause of acute interstitial nephritis<sup>5</sup>.

Other important causes for sterile pyuria are drug related. Mesalazine, an azodisalicylate used for treating colitis, has been reported to cause sterile pyuria and proteinuria secondary to severe interstitial nephritis<sup>6</sup>. Nitrofurantoin has also been linked to interstitial nephritis and sterile pyuria<sup>7</sup>. Sterile pyuria has also been seen with glucocorticoid therapy<sup>8</sup>.

#### Materials & Methods:

This cross sectional study was done in the department of Nephrology, BSMMU, during the period of September 2016 to August 2017. All adult patients with sterile pyuria were included in the study. A total number of 246 cases who had urinary WBCs >5 per high power field (HPF) with a negative culture were selected as sample by convenient sampling technique. We

performed detailed clinical and laboratory investigations to identify potential causes of the sterile pyuria. Data were analyzed using SPSS. A descriptive analysis was done on all variables to obtain a frequency distribution. The mean  $\pm$  SD and ranges were calculated for quantitative variables.

#### Results:

There were 246 cases of sterile pyuria in the study period with a range of 15 to 25 cases per month and a mean of about 20 cases per month. There sociodemographic characteristics and clinicopathological presentation are as follows.

**Table I**

*Socio-demographic characteristics of the study population (n=246)*

Socio-demographic variables	Number of patients	Percentage
Age (years)		
≤20	4	1.6
21-40	109	44.3
41-60	119	48.4
>60	14	5.7
Sex		
Male	115	46.7
Female	131	53.3
Educational status		
SSC or below	4	1.6
HSC	95	38.6
Graduate or above	147	59.8
Occupational status		
Farmer	12	4.9
Business	45	18.3
Service	75	30.5
Housewife	97	39.4
Unemployed	17	6.9
Marital status		
Married	205	83.3
Unmarried	41	16.7
Residence		
Rural	72	29.3
Urban	174	70.7

Table I shows socio-demographics characteristics of the study population, it was observed that almost half (48.4%) patients belonged to age 41-60 years, 131(53.3%) were female, 147(59.8%) patients had completed graduate or above education, 97(39.4%) were

house wives, 205(83.3%) were married and 174(70.7%) come from urban area.

**Table-II**

*Presenting symptoms of the study population (n=246)*

Presenting symptoms	Number of patients	Percentage
Fever	79	32.1
Urinary tract symptom		
Frequency	44	17.9
Urgency	30	12.2
Flank pain	16	6.5
Abdominal pain	20	8.1
Dysuria	51	20.7
Swelling of the body	139	56.5
Dark colour urine	39	15.9
Oliguria	87	35.4
Polyuria	11	4.5
Cough	11	4.5
Rash	6	3.1
Low back pain	42	21.4

Table II shows presenting symptoms of the study patients, it was observed that 139(56.5%) patients had swelling of the body followed by 87(35.4%) had oliguria, 79(32.1%) had fever, 51(20.7%) had dysuria and 42(21.4%) had low back pain. Others result are depicted in this table.

**Table-III**

*Co-morbidities & taking drugs of the study population (n=246)*

Co-morbidities & drugs	Number of patients	Percentage
Diabetes mellitus	115	46.7
Hypertension	113	45.9
Cerebrovascular disease (Stroke)	21	8.5
CKD	67	27.2
NSAIDs use	45	18.3
Antibiotic use	51	20.7

Table III shows co-morbidities & history of taking drugs of the study population, it was observed that 115(47.7%) patients had diabetes mellitus, 113(45.9%) had hypertension, 67(27.2%) had CKD, 51(20.7%) had history of antibiotic use and 45(18.3%) had history of

NSAID use. Others result are depicted in this table.

**Table-IV**

*Clinico-pahological findings of the study population (n=246)*

Clinico-pahological findings	Number of patients	Percentage
Temperature		
Normal	171	69.5
Raised	75	30.5
Protein		
Nil	107	43.5
(+)	41	16.7
(++)	35	14.2
(+++)	42	17.1
(++++)	21	8.5
RBC		
0-5/hpf	160	65.0
6-15/hpf	59	24.0
15-30/hpf	5	2.0
≥30 /hpf	22	9.0
WBC		
≤30 /hpf	167	67.9
>30/hpf	79	32.1
Urine for esonophil	28	11.4
Fungi	10	4.1
Cast	51	20.7
Haemoglobin (gm/dl)		
Normal	84	34.1
Abnormal	162	65.9
ESR (mm in 1st hour)		
Normal	38	15.4
Raised	208	84.6
Total WBC count (/mm <sup>3</sup> )		
Normal	176	71.5
High	70	28.5
hCRP		
Normal	151	61.4
Raised	95	38.6
Renal impairment in terms of serum creatinine		
<130 (no renal impairment)		98
39.8		
130-173 (mild)	32	13.0
>173-300 (moderate)	47	19.1
300 (severe)	69	28.0
BUN	24.1	±34.5
Range (min-max)	6.0	-196.0
Serum albumin (gm/l)	35.5	±8.9
Range (min-max)	13	-50

Table IV shows clinico-pahological findings of the study population, it was observed that 171(69.5%) patients had normal temperature, 107(43.5%) & 160(65.0%) had no proteinuria & hematuria respectively, 167(67.9%) had urinary WBCd<sup>30</sup> /hpf, 176(71.5%) had normal total WBC count, and 98(39.8%) had no renal impairment in terms of serum creatinine. Others result are depicted in this table.

**Table-V**

*Diagnosis of the study population (n=246)*

Diagnosis	Number of patients	Percentage
Glomerulonephritis	81	32.9
Interstitial nephritis	40	16.3
Treated UTI	30	12.2
Renal tuberculosis	13	5.3
Renal stone disease	12	4.9
ADPKD	10	4.1
Funguria	10	4.1
Pneumonia	16	6.5
Dengue	8	3.3
Septicemia	5	2.0
Leptospirosis	3	1.2
Malaria	3	1.2
Typhoid	2	0.8
Lack of follow up	13	5.3

Table V shows diagnosis of the study population, it was observed that 81(32.9%) patients had glomerulonephritis, 40(16.3%) had interstitial nephritis, 30(12.2%) had history of treated UTI, 13(5.3%) had renal tuberculosis and 13(5.3%) was lack of follow up. Others result are depicted in this table.

### Discussion:

This cross sectional study was carried out with an aim to determine patients with sterile pyuria by sociodemographic and clinical risk. A total of 246 sterile pyuria patients attending in the Department of Nephrology, Bangabandhu Sheikh Mujib Medical University, Dhaka, during the period from September 2016 to August 2017 were included in this study. Among 246 sterile pyuria patients, 13 patients were lack of follow up. The present study findings were discussed and compared with previously published relevant studies.

In this present study it was observed that, almost half (48.4%) patients belonged to age 41-60 years, 131(53.3%) were female, 147(59.8%) patients had completed graduate or above education, 97(39.4%) were house wives, 205(83.3%) were married and 174(70.7%) come from urban area. Majority 144(68.6%) patients belonged to age e<sup>18</sup> years and 66(31.4%) belonged to <18 years. Female was found 116(68.6%) and male was 94(68.6%) in infections outside the urinary tract group<sup>9</sup>. Another study found pyuria and urinary tract infection was seen in 52.9% and 29.4% of the women and in 48.2% and 10.7% of the men, respectively<sup>10</sup>. Those patients who were younger than 50 years old showed a greater specificity, compared to the older (68.0% versus 54.0%). Sterile pyuria is a highly prevalent condition, and population-based studies show that 13.9% of women and 2.6% of men are affected<sup>11</sup>.

In this study it was observed that 115(47.7%) patients had diabetes mellitus, 113(45.9%) had hypertension, 67(27.2%) had CKD, 51(20.7%) had history of antibiotic use and 45(18.3%) had history of NSAID use. In a study the underlying disorder was diabetes mellitus in 46 patients (51.1%) and hypertension in 18 (20.0%)<sup>10</sup>. Overall reported frequency of UTI among diabetics is 25.3%<sup>12</sup>.

In this current study it was observed that 139(56.5%) patients had swelling of the body followed by 87(35.4%) had oliguria, 79(32.1%) had fever, 51(20.7%) had dysuria and 42(21.4%) had low back pain. Fever was found 28.0%, abdominal pain 34.1%, flank pain 16.7% in patient's infections outside tract the urinary tract group<sup>9</sup>. In another study showed fever was present as a symptom in 41/97 (42.2%). Flank pain in 26/97 (26.8%). Lower urinary tract symptoms defined as frequency, urgency, dysuria or hesitancy were present in 56/97 (57.7%)<sup>13</sup>.

In this present study it was observed that 171(69.5%) patients had normal temperature, 107(43.5%) & 160(65.0%) had no proteinuria & hematuria respectively, 167(67.9%) had urinary WBCd<sup>30</sup> /hpf, 176(71.5%) had normal total WBC count, and 98(39.8%) had no renal impairment in terms of serum creatinine. A

study observed proteinuria in about 70% of our UTI patients<sup>13</sup>. In a study showed the absolute number of WBCs or red blood cells in the urine and the presence of casts, proteinuria, and leukocyte esterase were not associated with positive culture or urinary tract infection. They were surprised at the absence of a strong correlation between pneumonia and pyuria, since this association was reported in the literature and was one of the clinical observations leading to this study. In fact, in this sample, pneumonia was the least likely of the 5 infections to be associated with pyuria<sup>9</sup>.

The mean BUN and creatinine levels were also somewhat higher in patients with sterile pyuria (means of 20.2 vs 17.1 and 1.25 vs 1.05, respectively), but these differences were not statistically significant<sup>9</sup>. Others found mean serum creatinine was 1.56 SD±2.2<sup>13</sup>. High serum creatinine level and low serum albumin level are more common in patients with bacteremic UTIs caused by various kinds of pathogens<sup>14</sup>.

In a study found the incidence of AKI in UTI patient necessitating admission was 12.3%, only a few studies investigated the risk factors for AKI in UTI patients. They also showed that UTI patients with DM, upper UTI, afebrile or septic shock during hospitalization and impaired baseline renal function were at higher risk for development of AKI<sup>15</sup>. Others showed their study neither pyuria nor a positive culture was serum albumin. Sterile pyuria was unrelated to reported serum albumin<sup>9</sup>.

In this study it was observed that majority 81(32.9%) had glomerulonephritis, 40(16.3%) had interstitial nephritis, 30(12.2%) had treated UTI, 13(5.3%) had renal tuberculosis, 12(4.9%) had renal stone disease, 10(4.1%) had ADPKD and 10(4.1%) had funguria. *Sterile pyuria* may be seen in tuberculosis, renal papillary necrosis, acute interstitial nephritis and *glomerulonephritis*<sup>16</sup>. Intrinsic urinary tract pathology leading to sterile pyuria include papillary necrosis secondary to obstructive uropathy, tubulointerstitial nephritis, glomerulonephritis, interstitial cystitis, renal transplant rejection, and urinary tract tumors<sup>17</sup>. Most patients with renal TB have sterile pyuria,

which can be accompanied by microscopic hematuria<sup>18</sup>. More than 90% of asymptomatic patients have sterile pyuria, which can be accompanied by microscopic hematuria. Less than 10% of patients with renal TB have symptoms of renal colic<sup>19</sup>. Hematuria and pyuria are typical findings in genitourinary tuberculosis. Tubulointerstitial diseases such as interstitial nephritis, lupus nephritis, and renal transplant rejection can all lead to sterile pyuria. Drug reactions are a common cause of acute interstitial nephritis. Acute tubular interstitial nephritis usually results in proteinuria, hematuria, and sterile pyuria.

In this current study it was observed that 16(6.5%) had pneumonia, 8(6.5%) had dengue, 5(2.0%) had septicemia. In a study found their pneumonia was 8.9%, septicemia 31.8% in infections outside the urinary tract group<sup>9</sup>. They choice to look at patients with pneumonia and septicemia because prior studies have suggested a link between these infections and sterile pyuria<sup>20</sup>. The presence of pyuria does not usually indicate the presence of a UTI in patients with pneumonia, bacterial septicemia, intra-abdominal infection, and enteritis<sup>9</sup>

### Conclusions

The finding of pyuria without bacteriuria can often be a diagnostic challenge. However, the finding is not necessarily nonspecific; a careful history and physical examination can help determine the cause of the sterile pyuria. Sterile pyuria is associated with infectious and noninfectious causes, as well as systemic and localized diseases.

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