



Research Journal of **Microbiology**

ISSN 1816-4935



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Asymptomatic Bacteriuria and Pyuria in Patients with Chronic Renal Failure Undergoing Hemodialysis at Dialysis Centers in Kermanshah, Iran

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ABSTRACT

Pyuria is the presence of increased numbers of polymorphonuclear leukocytes in the urine and is evidence of an inflammatory response in the Urinary Tract Infection (UTI). The aim of this study is determination asymptomatic bacteriuria and pyuria in patients undergoing hemodialysis with chronic renal failure. Out of 103 patients with renal failure undergoing hemodialysis who were able to produce urine with clean catch way, we received urine sample. All samples were examined by the Microbiologist in Central Laboratory of Kermanshah, Iran. The mean age for the patients at diagnosis was 42.4 years (range, 20-67 years). Sixty-four patients (62.5%) were male and thirty-nine (37.5%) were female. Results have been showed 39 cases were aged between 44-49 years and the highest number cases were middle-aged. Out of 31 patients with leukocytosis, 14 patients had age between 44-49 years and majority of them were male. Pyuria (>10 WBC/HPF or <10 WBC/HPF) was more in male that had between 40-49 years. Patients (10/12) with pyuria (>10 WBC/HPF) developed colony count more than 10⁵ colony-forming units per milliliter that indicating positive culture. Microorganisms didn't grow in patients (10/19) with pyuria (<10 WBC/HPF). This study demonstrates that the UTI, even in end stage renal disease (ESRD) patients on hemodialysis, may represent a significant reservoir for infection and pyuria >10 WBC/HPF is a good marker for significant bacteriuria in these patients.

Key words: Bacteriuria, Escherichia coli, hemodialysis, pyuria, UTI

INTRODUCTION

Asymptomatic bacteriuria, or asymptomatic urinary infection, is isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from person without symptoms or signs referable to urinary infection (Rubin *et al.*, 1992). Pyuria is the presence of increased numbers of polymorphonuclear leukocytes in the urine and is evidence of an inflammatory response in the urinary tract (Stamm, 1983). Patients with renal failure on

maintenance hemodialysis have an increased incidence of infections due to defects in cellular immunity, neutrophil function and neutrophil response to infection (Lazarus and Hakim, 1991). Asymptomatic bacteriuria is a microbiologic diagnosis determined with a urine specimen that has been collected in a manner to minimize contamination and transported to the laboratory in a timely fashion to limit bacterial growth. The usual quantitative definition is 10^5 cfu mL⁻¹ (colony-forming units per milliliter) in 2 consecutive urine specimens (Nicolle *et al.*, 2005). Asymptomatic bacteriuria is a common complication after renal transplantation and the need for antibiotic therapy is controversial. If Urinary Tract Infection (UTI) occurred in this population it has proved harmful effect on allograft function and survival, in addition to infectious complications and bacteremia (Muller *et al.*, 1998). Less than 10^5 cfu mL⁻¹ usually meant persistently low levels of bacteriuria, with distinctive microflora for each group (Kass, 1960; Norden and Kass, 1968). To diagnose a patient with bacteriuria, whether it was symptomatic or asymptomatic, the presence of pyuria (≥ 10 leukocytes mm⁻³ of uncentrifuged urine) is not sufficient (Hooton *et al.*, 2000). But pyuria is evidence of inflammation in the genitourinary tract and is common in subjects with asymptomatic bacteriuria (Nicolle, 1997). The aim of this study is determination asymptomatic bacteriuria and pyuria in patients undergoing hemodialysis with chronic renal failure.

MATERIALS AND METHODS

Of 103 patients with renal failure undergoing hemodialysis who were able to produce urine with clean catch way, we received urine sample. It should be noted, hemodialysis patients who had evidence of urinary tract infection and a history of recent drug or illnesses that cause urinary stasis in the kidney were excluded from the our research. Two days after the last session of hemodialysis, urine volume (12 mL) was prepared per the patient. All samples were examined by the microbiologist in coordination by the Central Laboratory of Kermanshah, Iran. At the time sampling, 0.001 mL centrifuged urine volume in blood agar were cultured for 24 h. One milliliter of centrifuged urine for microscopic analysis was used by laboratory personnel. The collected data in this study were included test in the laboratory, interview and observation and also data gathering tool was questionnaire and an information form.

RESULTS

The mean age for the patients at diagnosis was 42.4 years (range, 20-67 years). Sixty-four patients (62.5%) were male and thirty-nine (37.5%) were female. Results given in Table 1 that 39 cases were aged between 44 to 49 years and the highest number cases were middle-aged. Of

Table 1: Distribution of patients by age and sex and presence or absence of leukocytosis

Age	Positive						Negative						Total			
	Male		Female		Total		Male		Female		Total		Male		Female	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
20-25	1	5.5	-	-	1	3.3	3	6.5	1	3.9	4	5.6	4	6.2	1	2.6
26-31	-	-	1	7.7	1	3.3	3	6.5	1	3.9	4	5.6	3	4.6	2	5.2
32-37	2	11.2	1	7.7	3	9.7	6	13.0	4	15.3	10	13.8	8	12.5	5	12.8
38-43	2	11.2	2	15.4	4	12.9	13	28.3	7	26.9	20	27.7	15	23.5	9	23.1
44-49	8	44.4	6	46.2	14	45.1	17	36.9	8	30.7	25	34.7	25	39.1	14	35.8
50-55	4	22.2	2	15.3	6	19.3	2	4.4	3	11.5	5	7.0	6	9.4	5	12.8
56-61	1	5.5	1	7.7	2	6.4	1	2.2	2	7.8	3	4.1	2	3.1	3	7.7
62-67	-	-	-	-	-	-	1	2.2	-	-	1	1.4	1	1.6	-	-
Total	18	100.0	13	100.0	31	100.0	46	100.0	26	100.0	72	100.0	64	100.0	39	100.0

Table 2: Distribution of patients by age and sex and pyuria (>10 WBC/HPF and <10 WBC/HPF)

Age	More than 10 WBC/HPF				Less than 10 WBC/HPF			
	Male		Female		Male		Female	
	No.	%	No.	%	No.	%	No.	%
20-25	-	-	-	-	1	9.09	-	-
26-31	-	-	-	-	-	-	1	12.5
32-37	1	14.2	1	20	1	9.09	-	-
38-43	1	14.2	1	20	1	9.09	1	12.5
44-49	3	42.8	2	40	5	45.40	4	50.0
50-55	2	28.5	1	20	2	18.18	1	12.5
56-61	-	-	-	-	1	9.09	1	12.5
62-67	-	-	-	-	-	-	-	-
Total	7	100.0	5	100	11	100.00	8	100.0

Table 3: Distribution of patients by age and culture with pyuria (>10 WBC/HPF)

Age	Mixed						No growth	Strept group	Strept group	No growth <3 microorganisms	Total
	<i>E. coli</i>	germ	Staphylococcus	<i>S. aureus</i>	Enterococcus	<i>Klebsiella pneumoniae</i>					
20-25	-	-	-	-	-	-	-	-	-	-	-
26-31	-	-	-	-	-	-	-	-	-	-	-
32-37	1	-	-	-	-	1	-	-	-	-	2
38-43	1	-	1	-	-	-	-	-	-	-	2
44-49	3	-	1	-	-	-	-	1	-	-	5
50-55	-	2	-	-	1	-	-	-	-	-	3
56-61	-	-	-	-	-	-	-	-	-	-	-
62-67	-	-	-	-	-	-	-	-	-	-	-
Total	5	2	2	-	1	1	-	-	1	-	12

Table 4: Distribution of patients by age and culture with pyuria (<10 WBC/HPF)

Age	Mixed						No growth	Strept group	Strept group	No growth <3 microorganisms	Total
	<i>E. coli</i>	germ	Staphylococcus	<i>S. aureus</i>	Enterococcus	<i>Klebsiella pneumoniae</i>					
20-25	1	-	-	-	-	-	-	-	-	-	1
26-31	-	-	-	-	-	-	-	-	-	1	1
32-37	-	-	-	-	-	-	1	-	-	-	1
38-43	-	-	-	-	-	-	1	-	-	1	2
44-49	1	-	1	-	-	1	5	-	1	-	9
50-55	-	-	1	-	-	-	1	-	-	1	3
56-61	-	-	-	-	-	-	2	-	-	-	2
62-67	-	-	-	-	-	-	-	-	-	-	-
Total	2	-	2	-	-	1	10	-	1	3	19

31 patients with leukocytosis, 14 patients had age between 44 to 49 years and majority of them were male. Pyuria (>10 WBC/HPF or <10 WBC/HPF) was more in male that had between 40 to 49 years (Table 2). Patients (10/12) with pyuria (>10 WBC/HPF) developed colony count more than 10^5 cfu mL⁻¹ that indicating positive culture (Table 3). Microorganisms didn't grow in patients (10/19) with pyuria (<10 WBC/HPF) (Table 4).

DISCUSSION

Pyuria (>10 WBC/HPF) is an important test that can differentiate UTI from colonization or contamination of the urine (Stamm *et al.*, 1982) and most authors support pyuria (<10 WBC/HPF) as being indicative of presence of low risk of bacterial infections (Chiu *et al.*, 1997). Pyuria can be a criterion for urinary infection. Asymptomatic bacteriuria is rare among healthy young men (Lipsky, 1989), but prevalence increases with advancing age to reach about six percent at 60 years of age and to 15% of men over 75 years of age (Nicolle, 1997). The prevalence of asymptomatic bacteriuria among healthy women increases with advancing age, from about one percent among schoolgirls to >20% among women over 80 years residing in the community (Bengtsson *et al.*, 1998).

UTI is more common in men asymptomatic patients undergoing hemodialysis. Patients undergoing hemodialysis have a prevalence of asymptomatic bacteriuria of 28% (Chaudhry *et al.*, 1993) in our study was 30%. Twenty five percent to 50% of elderly women and 15-40% of elderly men in long-term care facilities are bacteriuric (Nicolle, 1997). A high incidence of pyuria has been reported in patients on hemodialysis, but has not been correlated with bacteriuria (Cabaluna *et al.*, 1977), but asymptomatic bacteriuria is associated with an increased risk of symptomatic urinary tract infection is in agreement with findings of other investigators (Kunin, 1970; Gaymans *et al.*, 1976) this association with pyuria in many cases will eventually develop into symptomatic true UTI (Hooton *et al.*, 2000; Asscher *et al.*, 1969; Chaudhry *et al.*, 1993) like our study. Some authors agree with the fact that the sensitivity, specificity and positive predictive value of the urine analysis is low and only a third to half of patients with positive urine culture results can be identified correctly (Lin *et al.*, 2000). Of the 103 patients with renal failure on hemodialysis, 31 patients had leukocytosis that 12 of them are located in pyuria (>10 WBC/HPF) group and 19 of them in pyuria (<10 WBC/HPF). Of 12 patients in pyuria (>10 WBC/HPF) 10 (83.3%) patients had positive urine culture result. Microorganisms responsible for contamination are usually commensals from the distal urethra or periurethral areas, including Lactobacilli, Staphylococci (coagulase-negative), Corynebacteria and Streptococci (Marrie *et al.*, 1978). Other Enterobacteriaceae (such as *Klebsiella pneumoniae*) and other organisms (including coagulase-negative staphylococci, *Enterococcus* sp., group B streptococci and *Gardnerella vaginalis*) are common as well. For men, coagulase-negative staphylococci are also common, in addition to gram-negative bacilli and *Enterococcus* sp. (Lipsky *et al.*, 1984; Mims *et al.*, 1990). Microorganisms responsible in this study were *Escherichia coli*, Mixed gram, Staphylococci, *Enterococcus* sp. and *Klebsiella pneumoniae*. Up to 90% of UTIs in normal outpatients are due to *Escherichia coli* (Rubin *et al.*, 1991). *E. coli* remains the single most common organism isolated from women, but other organisms, such as *Proteus mirabilis*, are more common in men (Nicolle, 1997). Also, many organisms that cause asymptomatic bacteriuria may be less virulent (Roos *et al.*, 2006).

CONCLUSION

This study demonstrates that the UTI, Even in End Stage Renal Disease (ESRD) patients on hemodialysis, may represent a significant reservoir for infection and pyuria >10 WBC/HPF is a good marker for significant bacteriuria in these patients (especially in the age 44-49 years group).

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