Increased urine interleukin (IL)-17 and IL-22 in patients with Candida urinary tract infection

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Objectives: Candiduria is a common finding in the hospitalized patients. The goal of this study was to quantify interleukin (IL)-17 and IL-22 levels in urine of candiduric and non-candiduric subjects.

Methods: A case control study was conducted. Urine specimens were obtained from 338 patients hospitalized in Hashemi Nejad Kidney Center over nine months. Thirty four patients who fulfilled the inclusion criteria (>10³ CFU/ml and presence of only *Candida* species in urine specimen) were enrolled as case group and urine samples with concomitant infections were excluded. Thirty four patients with negative direct examination and culture were included as control patients. Then IL-17 and IL-22 were measured in the lyophilized and non lyophilized urine. The relevant cytokine titers of the two groups were compared and the associated of cytokines elevation and candiduria was investigated.

Results: The majority of candiduric patients were from ICU and urology units of women. Only 4 patients (11.7%) manifested fever and dysuria. Massive leukocyturia (>50 WBC per hpf) was observed in urine of 4 patients(Table 1). *Candida glabrata* was commonly isolated species (44 %)(Table 2). Levels of the urine IL-17 and IL-22 were significantly elevated in candiduric patients when compared to non-candiduric control subjects. While an increased IL-17 level was significantly associated with candiduria {Odds ratio1.09, 95 % confidence interval 1.003 - 1.17; P=0.04}, an increased IL-22 level was not. The results showed that lyophilized urine samples will maximize the detection power of urinary cytokines (Table 3).

Table 1. Characteristics of Patients With Candiduria and Control Group

Variables	Case group(n=34) N(%)	Control group(n=34) N(%)	p value
Mean age in years(range)	59.5(17-89)	50.7(21-65)	0.037
Sex(Male/Female)	14/20	16/18	NS
Foley catheter	21(61.8)	16(47.1)	NS
Diabetes	19(55.9)	2(5.9)	0.0001
Prior antibiotics usage	12(35.2)	1(2.9)	0.001
Hospitalized within at least 6 months	4(11.7)	0	NS
Mortality	7(20.5)	0	0.011
Central venous line	8(23.5)	0	0.005
Hospitalized in ICU	12(35.2)	0	0.001
Dialysis	1(2.9)	0	NS
Renal transplantation	2(5.9)	0	NS
Heavy leukocyturia(>50 WBC per hpf)	4(11.7)	0	NS
Fever and dysuria	4(11.7)	0	NS
Mental confusion	5(14.7)	0	0.053
Surgery	8(23.5)	10(29.4)	N.S

Table 2. *Candida* Species in Subgroups of Patients with Candiduria

Patients subgroups	Candida species				More than one Candida species N(%)
	<i>C.albicans</i> N (%)	<i>C.glabrata</i> N (%)	<i>C. tropicalis</i> N (%)	<i>C.krusei</i> N (%)	
patients in case group(n=34)	9(26.4)	15(44)	3(9)	1(3)	6(17.6)
Diabetic patients(n=19)	4(22)	9(47)	2(10)	0	4(21)
Catheterized patients(n=21)	4(19)	10(47.5)	2(10)	0	6(23.5)
Patients with prior antibiotic usage(n=12)	3(25)	3(25)	2(16.3)	0	4(33.7)
Female gender(n=20)	4(20)	9(45)	3(15)	1(5)	3(15)

Table 3. Associations Between Increased Lyophilized Urine Levels of Interleukins and Candiduria

Cytokine(pg/ml)	Multiple analysis	P values
	Adjusted OR(95% CI)	
IL -17	1.09(1.003-1.17)	0.04
IL -22	1.03(0.987-1.07)	0.19

Odds ratios (OR) were adjusted for age, sex and indwelling Foley.
CI= confidence interval

Conclusions: Our results indicated that direct examination, fungal urine culture, and investigation of urine IL-17 and IL-22 levels are useful tools for diagnosis of *Candida* urinary tract infection.

Keywords: urinary tract infections, candida, interlukin 17, candiduria