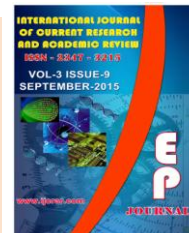




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Evaluation of Procalcitonin level in patients with Urinary Tract Infection (UTI)

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KEYWORDS

Urinary tract infection,
PCT

A B S T R A C T

Urinary tract infection (UTI) is one of the most common infections and the incidence rate of that is 150 million per year. Among the latest sepsis biomarkers, Procalcitonin has the highest diagnostic accuracy. The PCT level rapidly grows (within 6 to 12 hours) with systemic complications after an infectious attack. PCT measurement is recommended for quick and effective diagnosis in patients who are suspected of sepsis and systemic inflammatory response. The aim of this study was evaluation of serum level of PCT in patient whit UTI. In a cross-sectional study which I conducted in a private clinic in Tabriz, I examined serum level of Procalcitonin in patients with UTI. In this study, 23 patients with UTI enrolled into the study. Nine male patients and 14 female patients were selected. Mean age of patients was 61.69 ± 13.47 year. Nine patients had positive history of HTN, two patients had positive history of ESRD and 3 patients had positive history of DM. Mean level of PCT was 0.2756 ± 0.2497 . Significant difference was not found between two genders of patients ($P=0.432$). Serum level of PCT in patient's whit UTI was not high.

Introduction

Urinary tract infection (UTI) is one of the most common infections, and the second most common infection after respiratory tract infections [1]. The incidence rate of this infection is about 150 people per year in the world [2]. Based on estimations, 40% of women suffer from this infection at some point in their lives [3]. The most common bacteria sampled from patients with urinary tract infections, especially women, are *Escherichia coli* (*E. coli*), *Klebsiella* species,

other enterobacteriaceae, *Pseudomonas aeruginosa*, and enterococcus [4]. Recent studies suggest that microbial species are the cause of UTIs in different parts of the world. Therefore, it seems necessary to study the microbial agents causing infections in all parts of the world. Numerous bacteria are capable of inducing infections in the urinary tract, but *E. coli* is known as the most common cause of infection [4-6].

Final diagnosis of UTI is possible using urine culture. Appropriate culturing depends on the sample quality, the time and precision used for sampling, and the examiner's expertise and skill. Since urine culture is costly and requires passage of time, the physician often does not wait for the results of the culture to treat UTIs and fecal infections and starts treatment based on speculations and an empirical diagnosis. Understanding pathogenic agents and their microbial sensitivities can help the physician prescribe proper drugs [7].

Among the latest sepsis biomarkers, Procalcitonin has the highest diagnostic accuracy. The PCT level rapidly grows (within 6 to 12 hours) with systemic complications after an infectious attack. PCT measurement is recommended for quick and effective diagnosis in patients who are suspected of sepsis and systemic inflammatory response(8-9). The aim of this research was to measure the levels of PCT in patients with UTI.

Materials and methods

In a cross-sectional study which I conducted in a private clinic in Tabriz, I examined serum level of Procalcitonin in patients with UTI.

Patients with suspicion of UTI was selected and enrolled into the study. After examining and recording their history, U/A checked and after verifying the diagnosis of UTI and before beginning antibiotic treatment, blood samples were taken to measure serum levels of PCT.

A written consent was obtained from all patients after providing necessary explanations to them and their families about aims of the study and the method. Blood samples were obtained and were delivered to the laboratory. The

measurement was performed using electrochemiluminescence method which is a fast and high quality experiment. Finally, the values of PCT were extracted and analyzed.

Statistical analysis

Collected data were analyzed using SPSS statistical package v.21. For statistical analysis of demographic data and for comparison of groups independent samples t-test and chi-square test were used. A P Value< 0.05 was taken as statistically significant.

Ethical considerations

Given that we did not interfere in the treatment process of patients, thus there is no moral problem in our study. Moreover, after providing the patients with sufficient, comprehensible information, their consent was obtained for participating in the study. Furthermore, with regard to measuring the PCT level, no cost was imposed to the patients and all expenses related to checking the PCT level were paid by the researcher. Patients were also free not to cooperate any more at any stage of the study.

Results and Discussion

In this study, 23 patients with UTI enrolled into the study. Nine male patients and 14 female patients were selected. Mean age of patients was 61.69 ± 13.47 year and demographics and clinical findings of patients between two genders were shown in table 1.

Nine patients had positive history of HTN, two patients had positive history of ESRD and 3 patients had positive history of DM. Mean level of PCT was 0.2756 ± 0.2497 . Distribution of PCT level of patients based on gender was shown in chart 1 and others laboratory findings were shown in table 2.

Significant difference was not found between two genders of patients (P=0.432). Demographics and clinical finding of patients with HTN and DM was shown in table 3. Laboratory finding of patients with HTN and DM was shown in table 4.

UTI is a broad term, which includes conditions from asymptomatic colonization to symptomatic infections with invading microbes and urinary tract inflammation. Acute urinary tract infections can be anatomically classified into two groups:

lower urinary tract infections (including urethritis and cystitis), and upper urinary tract infections (including pyelonephritis, prostatitis, intra-renal abscess, and peri-renal abscess). Infections in different areas may be either separate or combined, and these infections can also be asymptomatic. Urethra and bladder infections are usually known as superficial or mucosal infections. However, prostatitis, pyelonephritis, and collection of pus in kidneys indicate tissue invasions(1-7).

Table.1 Demographics and clinical finding of patients between two genders

	Sex		P
	Male	Female	
Age	75.79±11.58	65.33±14.37	0.068
Weight	83.64±6.46	74.56±11.07	0.021
Height	176.64±7.37	169.44±7.52	0.034
BMI	26.90±.78	26.02±3.82	0.528
Systolic Blood Pressure	128.93±19.13	125.00±10.31	0.580
Diastolic Blood Pressure	76.43±7.70	76.67±6.61	0.940

Table.2 Laboratory and clinical finding of patients between two genders

	Sex		P
	Male	Female	
WBC	9864.29±4906.76	8600.00±3151.98	0.501
Hb	15.14±2.15	13.39±1.82	0.056
Hct	48.46±7.18	43.90±8.29	0.176
PLT(*10 ³)	181.64±78.58	224.55±74.74	0.207
Blood Sugar	137.43±2.44	138.22±3.56	0.259
Na [±]	4.57±0.42	4.39±0.43	0.531
K [±]	146.64±48.69	185.22±109.77	0.323

Table.3 Demographics and clinical finding of patients with HTN and DM

	HTN			DM		
	Positive	Negative	P	Positive	Negative	P
Age	64.78±8.48	59.71±15.88	0.392	61.75±7.80	61.68±14.55	0.993
Weight	78.89±12.40	80.86±7.46	0.638	76.50±12.34	80.84±9.00	0.418
Height	171.78±8.44	175.14±7.89	0.342	169.75±9.11	174.68±7.86	0.278
BMI	26.81±4.28	26.40±2.39	0.773	26.74±5.44	26.52±2.71	0.904
Systolic Blood Pressure	136.67±18.03	121.43±11.84	0.023	145.00±21.21	123.68±12.57	0.012
Diastolic Blood Pressure	80.00±6.12	74.29±7.03	0.035	82.50±6.45	75.26±6.76	0.064

Table.4 Laboratory finding of patients with HTN and DM

	HTN			DM		
	Positive	Negative	P	Positive	Negative	P
WBC	10544.44±2946.23	8614.29±4894.09	0.301	9800.00±3643.26	9278.95±4475.31	0.830
Hb	15.01±2.39	14.10±2.02	0.337	15.78±1.91	14.18±2.16	0.187
Hct	49.37±8.11	44.95±7.35	0.191	53.20±4.90	45.31±7.66	0.064
PLT(*10 ³)	205±72.38	194.21±84.35	0.755	214.25±64.31	195.10±82.13	0.665
Urea	65.89±29.73	49.36±22.34	0.143	80.50±37.39	50.63±20.97	0.033
Na [±]	137.22±3.96	138.07±2.02	0.503	136.25±5.32	138.05±2.20	0.260
K [±]	4.69±0.43	4.38±0.38	0.085	4.83±0.43	4.43±0.40	0.090
Blood Sugar	177.56±102.27	151.57±60.76	0.451	250.00±121.94	143.16±54.28	0.010

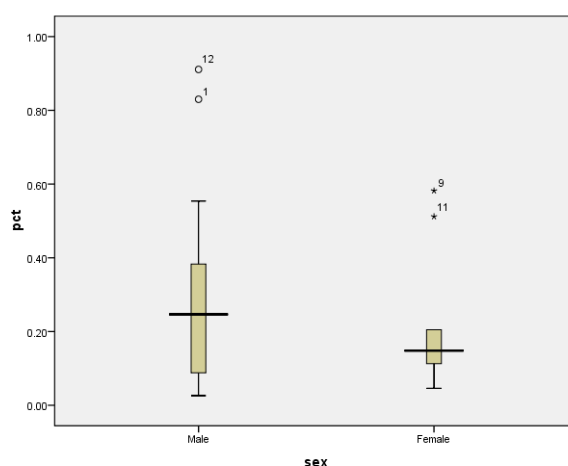


Chart.1 Distribution of PCT level of patient's whit UTI between two genders

Determining the number and type of bacteria in urine is a highly important diagnostic method. Since the plentitude of bacteria in bladder urine is partly the result of bacteria proliferation in the bladder cavity, the urine samples obtained from ureters and renal pelvis may reveal infections with fewer than 10⁵ bacteria per ml. Similarly, the presence of bacteriuria to any degree in suprapubic aspiration samples or presence of at least 10² bacteria per ml of urine samples obtained from catheterization is a sign of infection [10-12]. Quick methods for diagnosis of bacteriuria were devised as alternatives to the standard culture methods.

PCT is a 116-amino acid protein with a molecular weight of 12793 Da. It is also a

precursor of the calcitonin hormone. Most of the precursors of calcitonin, including PCT, are found in the serum of normal people with a plasma level lower than 0.1 ng/ml (13). In bacterial infections, PCT increases depending on the severity of infection. An example of these infections is bacterial meningitis (14).

Several biomarkers are increased in bacterial infections. Such biomarkers include ESR, CRP, and Procalcitonin(15). In addition, reduction in its level is useful in decision-making for the duration of antibiotic treatment and helps predicting the mortality rate (15). If the level of PCT in serum or plasma of the patient is over 0.5 ng/ml in the early hours, it reflects a bacterial infection,

but if the serum or plasma PCT level increases after 6 hours, it will be a suitable and reliable indicator of septic shock in such patients. In the latter case, antibiotic treatment is necessary (16).

In healthy individuals, concentration of plasma PCT is lower than 0.5 ng/ml, while in patients with sepsis, severe sepsis or infectious shock this can increase to 1000 ng/ml (17). Albrich et al. found that the Procalcitonin level is useful as guidance on the method and time of administration of antibiotics in UTI (18).

Polzin et al. stated that Procalcitonin is a useful marker for assessment of infections and a suitable guide for the start of antibiotic treatments in such patients (19). Fazili et al. introduced Procalcitonin as a bacterial infection biomarker (20).

Greulich et al. stated that it is possible to use Procalcitonin as a biomarker for diagnosis of infections (21). In our study, the mean level of PCT was 0.2756 ± 0.2497 . Significant difference was not found between two genders of patients, that shown the mean of Procalcitonin of our patients was more than 0.6 and also in 5 patients Procalcitonin was more than 0.5 and was more than 0.6 only two patients. The results of our study suggest that Procalcitonin in patients with UTI was not increased significantly and Serum level of PCT in patient's with UTI was not high.

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