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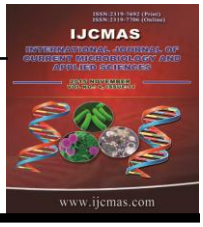


Original Research Article

Evaluation Serum Procalcitonin Level in Febrile Patients in Emergency Ward

Hamidreza Morteza Baghi[1], Zahra Attari[2]*, Mehdi Farzmehdi[3], Sabah Hassani[3], Sepehr Taghizadeh[4], Mehdi Haghdoost[4] and Elham Khanlarzadeh[5]

[1]Assistant Professor of Emergency Medicine, Emergency Medicine Department, Faculty of Medicine, Tabriz University of medical sciences, Tabriz, Iran
[2]Infectious disease specialist, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Pulmonology and Critical Care Medicine Fellowship, Internal Medicine Department, Faculty of Medicine, Tabriz University of medical sciences, Tabriz, Iran
[4]Infectious and Tropical disease research center, Infectious diseases department, Tabriz university of medical sciences, Tabriz, Iran
[5]Department of Community Medicine, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran
**Corresponding author*

A B S T R A C T

Fast and appropriate sepsis diagnosis is a part of everyday challenges of emergency and ICU departments. Rapid detection of bacteremia facilitates early implementation of therapy and identifies patients at high risk for complications. PCT biomarker is now widely used in Europe to identify and assess the systemic inflammatory response. The aim of this study was evaluation serum level of Procalcitonin in febrile patients in emergency ward of Emam Reza hospital. In a descriptive-analytical study that performed in Emergency Medicine Department of Tabriz Medical Sciences University on febrile patients, serum level of Procalcitonin evaluated. In this study, 30 febrile patients (17 male and 13 female) enrolled into the study. Mean age, Weight, Height and BMI of patients were 68.70±13.09 year, 77.93±9.14 kg, 1.71±0.07 meter and 26.44±2.76, respectively. Mean body temperature (BT) of patients was 39.27±1.12. Mean Systolic Blood Pressure of patients was 125.66±15.85. Mean Diastolic Blood Pressure of patients was 76.33±6.55. Mean Procalcitonin (PCT) of patients was 0.406±0.547. Mean Procalcitonin (PCT) of male patients was 0.353±0.492 and in female patients was 0.476±0.625. Significant difference was not found between mean Procalcitonin (PCT) of patient in two genders (P=0.551)

Keywords

Procalcitonin, Emergency Ward, Febrile Patient

Introduction

Fast and appropriate sepsis diagnosis is a part of everyday challenges of emergency and ICU departments. Today, different treatments methods have resulted in

improved survival of patients with sepsis. Therefore, a fast and accurate diagnosis is essential. There are no signs and symtoms specific to sepsis. Moreover, microbial culture is time consuming and does not indicate the patient's systemic inflammatory response. At the same time, it does not reveal any malfunction of organs and for various reasons it might not be positive in patients with sepsis(1).

Rapid detection of bacteremia facilitates early implementation of therapy and identifies patients at high risk for complications(1-2). Previous studies demonstrated that various clinical markers have poor sensitivity and specificity for predicting early bacteremia in febrile patients(1,3-7). Similarly, ruling out bacterial sepsis in febrile patients has substantial benefits, including reduction of hospitalization and antimicrobial use and facilitating clinician focus on alternative diagnostic pathways(8-9).

Identifying whether the cause of inflammation in patients is of bacterial origin has been an important area of development in the clinical laboratory. Several clinical laboratory tests have been applied to the diagnosis of sepsis(10). The broth culture method is the gold standard for the diagnosis of bacterial infection, but a definitive result can take 24 hours or more before a conclusive diagnosis.

A number of the inflammatory markers, such as leukocyte cell count, C reactive protein (CRP), and cytokines (TNF-α, IL-1β, or IL-6), have been applied in the diagnosis of inflammation and infection, but their lack of specificity has generated a continued interest to develop more specific clinical laboratory tests(11).

Among the latest sepsis biomarkers, PCT 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.

In addition to the diagnostic value of PCT in sepsis, PCT is also useful in monitoring the process and severity of the systemic inflammatory response. Daily changes of the PCT level in plasma are considered as a marker of the disease process and prognosis of patients with sepsis. Survival or continuing high levels of PCT is associated with adverse outcome for the patient and is indicative of deficiency of treatment or lack of cleansing the infection. PCT biomarker is now widely used in Europe to identify and assess the systemic inflammatory response.

The aim of this study was evaluation serum level of Procalcitonin in febrile patients in emergency ward of Emam Reza hospital.

Materials and Methods

In a descriptive-analytical study that performed in Emergency Medicine Department of Tabriz Medical Sciences University on febrile patients, serum level of Procalcitonin evaluated.

In this study, 30 febrile patients that referred to emergency ward of Imam Reza Hospital were enrolled into the study.

Patients were treated by standard and routine. No intervention in the treatment of patients, a blood sample was taken to measure the level of PCT. Not impose additional costs on patients.

Ethical Considerations

No invasive measure was taken in this study and no change was caused to the treatment

of patients. Moreover, no additional expense was imposed on the patients for Procalcitonin measurements and all of the patient information will remain confidential.

Statistical Analysis

The collected data were analyzed by SPSS-17 statistical software. The collected data were expressed as percentage and mean ± SD. Continuous (quantitative) variables were compared by Independent samples and Paired t test. Categorical (qualitative) variables were compared by contingency tables and Chi-square test or Fisher's exact test. P-value ≤0.05 was considered statistically significant.

Results and Discussion

In this study, 30 febrile patients (17 male and 13 female) enrolled into the study.

Mean age of patients was 68.70±13.09 year. Mean weight of patients was 77.93±9.14 kg. Mean height of patients was 1.71±0.07 meter. Mean BMI of patients was 26.44±2.76.

Mean body temperature (BT) of patients was 39.27±1.12. Mean Systolic Blood Pressure of patients was 125.66±15.85. Mean Diastolic Blood Pressure of patients was 76.33±6.55.

Mean age of male patients was 65.88±14.70 and in female patients was 72.38±10.02. Significant difference was not found between mean age of patient in two genders (P=0.182). Mean weight of male patients was 81.82±7.65 and in female patients was 72.84±8.62. Mean weight of male patients was significantly higher than female patients (P=0.005). Mean height of male patients was 1.75±0.06 and in female patients was 1.66±0.05. Mean height of male patients was significantly higher than female patients (P=0.001). Mean BMI of male patients was 26.66±2.77 and in female patients was 26.14±2.82. Significant difference was not found between mean BMI of patient in two genders (P=0.619).

Mean Procalcitonin (PCT) of patients was 0.406±0.547. Mean Procalcitonin (PCT) of male patients was 0.353±0.492 and in female patients was 0.476±0.625. Significant difference was not found between mean Procalcitonin (PCT) of patient in two genders (P=0.551).

Seven patients had history of DM and 8 patients had positive history of HTN. Distribution of Procalcitonin (PCT) in two genders was shown in chart 1. Laboratory findings of patients were shown in table 1.

In conclusion, PCT is actually calcitonin prohormone or prehormone, however, PCT and calcitonin are actually two different proteins. Calcitonin is exclusively produced by C cells of the thyroid gland in response to hormonal stimulation while various cells in organs can produce procalcitonin in response to pro-inflammatory stimuli, especially bacteria.

In healthy people, plasma PCT concentration is less than 0.05ng/ml and in patients with sepsis, severe sepsis or septic shock can increase to 1000 ng/ml. The procalcitonin concentration above 0.5ng/ml is usually considered abnormal and may be indicative of sepsis. PCT levels between 0.5-2ng/ml raise a gray zone and sepsis with uncertainty. In such cases, the test is recommended to be repeated after 6 to 24 hours. PCT greater than 2 strongly suggests an infectious process with systemic complications. Concentrations above 10 ng / ml are almost exclusively observed in patients with severe sepsis or septic shock.

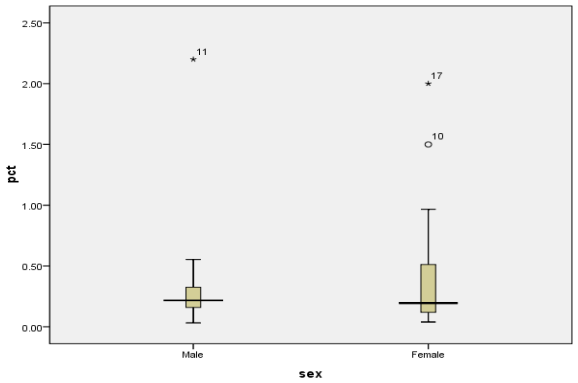
Table.1 Demographic Findings of Patients

	Sex			HTN			DM		
	Male	Female	P	Positive	Negative	P	Positive	Negative	P
Age	65.88±14.70	72.38±10.02	0.182	76.75±10.26	65.77±12.96	0.040	74.71± 9.05	66.87±13.74	0.169
Weight	81.82±7.66	72.85±8.63	0.007	76.13±11.68	78.59±8.27	0.523	75.71±9.01	78.61±9.28	0.473
Height	175.35±6.45	166.92±5.81	0.001	167.88±8.79	173.09±6.52	0.088	164.86±8.25	173.78±5.87	0.003
BMI	26.67±2.78	26.15±2.82	0.620	27.05±4.06	26.22±2.20	0.475	27.97±3.78	25.97±2.27	0.094
SBP	124.71±18.24	126.92±12.67	0.711	139.38±16.78	120.68±12.47	0.003	137.86±19.55	121.96±12.86	0.017
DBP	74.71±5.99	78.46± 6.89	0.131	82.50±5.35	74.09±5.49	0.001	81.43±7.48	74.78±5.53	0.016

Table.2 Laboratory Findings of Patients

	Sex			HTN			DM		
	Male	Female	P	Positive	Negative	P	Positive	Negative	P
WBC	8452.94±3320.98	9307.69±4842.08	0.571	8587.50±3313.37	8909.09±4285.85	0.849	10528.57±5676.48	8304.35±3325.59	0.203
Hb	15.19±2.38	12.42±2.17	0.003	14.30±3.54	13.88±2.34	0.706	14.27±2.99	13.90±2.61	0.754
HCT	47.94±7.93	38.93±7.45	0.004	45.76±11.48	43.41±7.91	0.529	45.67±10.62	43.54±8.45	0.586
PLT	171.24±49.82	212.23±68.42	0.083	201.75±71.58	184.36±57.99	0.500	218.00±66.91	180.17±57.89	0.155

Chart.1 Distribution of Serum Level of Procalcitonin



Bacterial endotoxins and proinflammatory cytokines are strong incentives for the production of PCT. The main biological role of PCT is largely unknown; however, recent studies suggest a possible pathological role of PCT in sepsis.

The PCT protein has the adsorption properties of leukocytes and is responsible for adjusting nitric oxide production by endothelial cells. PCT is a stable protein in plasma and blood samples.

At room temperature, more than 80% of its initial value has stability after 24 hours and this degree increases to more than 90% if the sample is to be kept in the refrigerator with a temperature of 4 degrees.

PCT plasma has a half-life of 25 to 30 hours in healthy subjects and it will be extended to 30 to 45 hours in patients with severe malfunction of kidneys. In patients with SIRS, the PCT level is usually low (<1ng/ml). After multiple traumas, major surgeries, or severe burns the PCT level increases independent of the infectious process. Reduction of the PCT level to the baseline values is usually fast in this group of patients and any subsequent increase of PCT could be indicative of sepsis attack.

Viral infections, bacterial colonization, localized infections of allergic diseases, autoimmune diseases as well as transplant rejection do not usually lead to a significant response in the PCT. (PCT < 0.5 ng/ml)
Procalcitonin is a helpful biomarker for early diagnosis of sepsis in critically ill patients. Nevertheless, the results of the test must be interpreted carefully in the context of medical history, physical examination, and microbiological assessment(12).

Rapid treatment of sepsis is of crucial importance for survival of patients. Specific and rapid markers of bacterial infection have been sought for early diagnosis of sepsis. One such measurement, Procalcitonin (PCT), has recently become of interest as a possible marker of the systemic inflammatory response to infection(13).

PCT is among the most promising sepsis markers, capable of complementing clinical signs and routine lab parameters suggestive of severe infection(13).

In our study, Mean Procalcitonin (PCT) of patients was 0.406±0.547. Mean Procalcitonin (PCT) of male patients was 0.353±0.492 and in female patients was 0.476±0.625. Significant difference was not found between mean Procalcitonin (PCT) of patient in two genders (P=0.551).

Holm et al. indicated that a Procalcitonin level of over 0.06 ng/ml reflects the existence of infection in patients suspected of CAP (14). Albrich et al. found that the Procalcitonin level is useful as guidance on the method and time of administration of antibiotics in CAP and UTI (15). Fazili et al. introduced Procalcitonin as a bacterial infection biomarker (16). Greulicn et al. stated that it is possible to use Procalcitonin as a biomarker for diagnosis of infections (17).

References

1.Tokuda Y, Miyasato H, Stein GH. A simple prediction algorithm for bacteraemia in patients with acute febrile illness. QJM. 2005 Nov;98(11):813-20.

2.Heper Y, Akalin EH, Mistik R, Akgöz S, Töre O, Göral G, et al. Evaluation of serum C-reactive protein, procalcitonin, tumor necrosis factor alpha, and interleukin-10 levels as diagnostic and prognostic parameters in patients with community-acquired sepsis, severe sepsis, and septic shock. Eur J Clin

Microbiol Infect Dis. 2006 Aug;25(8):481-91.

3.Bates DW, Sands K, Miller E, Lanken PN, Hibberd PL, Graman PS, et al. Predicting bacteremia in patients with sepsis syndrome. Academic Medical Center Consortium Sepsis Project Working Group. J Infect Dis. 1997 Dec;176(6):1538-51.

4.Bossink AW[1], Groeneveld J, Hack CE, Thijs LG. Prediction of mortality in febrile medical patients: How useful are systemic inflammatory response syndrome andsepsis criteria? Chest. 1998 Jun;113 (6):1533-41.

5.Bossink AW, Groeneveld AB, Thijs LG. Prediction of microbial infection and mo rtality in medical patients with fever: plasma proc alcitonin, neutrophilicelastase-alpha1-antitrypsin, and lactoferrin compared with clinical v ariables. Clin Infect Dis. 1999 Aug;29(2):398-407.

6.Jaimes F, Arango C, Ruiz G, Cuervo J, Botero J, Vélez G, Upegui N, Machado F. Predicting bacteremia at the bedside. Clin Infect Dis. 2004 Feb 1;38(3):357-62. Epub 2004 Jan 13.

7.Riedel S, Bourbeau P, Swartz B, Brecher S, Carroll KC, Stamper PD, et al. Timing of specimen collection for blood cultures from febrile patients with bacteremia. J Clin Microbiol. 2008 Apr;46(4):1381-5. doi: 10.1128/JCM.02033-07. Epub 2008 Feb 27.

8.Vorwerk C, Loryman B, Coats TJ, Stephenson JA, Gray LD, Reddy G, et al. Prediction of mortality in adult emergency department patients with sepsis. Emerg Med J. 2009 Apr; 26(4):254-8.

9.Lee CC, Chen SY, Tsai CL, Wu SC, Chiang WC, Wang JL, et al. Prognostic value of mortality in emergency department sepsis score, procalcitonin, and C-reactive protein in patients with sepsis at the emergency department. Shock. 2008 Mar;29(3):322-7.

10.Carrigan SD, Scott G, Tabrizian M. Toward resolving the challenges of sepsis diagnosis. *Clin Chem*. 2004;50:1301–1314.

11.Lever A, Mackenzie I. Sepsis: Definition, epidemiology, and diagnosis. *BMJ*. 2007;335:879–883.

12.Wacker C, Prkno A, Brunkhorst FM, Schlattmann P. Procalcitonin as a diagnostic marker for sepsis: a systematic review and meta-analysis. Lancet Infect Dis. 2013 May;13(5):426-35. doi: 10.1016/S1473-3099(12)70323-7. Epub 2013 Feb 1.

13.Uchil Sudhir, Ravi Kumar Venkatachalaiah, Thimmaiah Anil Kumar, Medha Yogesh Rao, and Punith Kempegowda Significance of serum procalcitonin in sepsis. Indian J Crit Care Med. 2011 Jan-Mar; 15(1): 1–5.

14.Holm A. (2007). Procalcitonin versus C-reactive protein for predicting pneumonia in adults with lower respiratory tract infection in primary care.*BJGen Parc*, 1, 556-560.

15.Albrich WC, Dusemund F, Bucher B, Meyer S, Thomann R, Kühn F, et al(2012). Effectiveness and safety of procalcitonin-guided antibiotic therapy in lower respiratory tract infections in "real life": an international, multicenter poststudy survey (ProREAL). *Arch Intern Med*,172(9),715-22.

16.Fazili T, Endy T, Javaid W, Maskey M(2012). Role of procalcitonin in guiding antibiotic therapy. *Am J Health Syst Pharm*,69(23),2057-61.

17.Greulich T, Koczulla AR, Vogelmeier C(2012). Chronic obstructive pulmonary disease : new pharmaco-therapeutic options. *Internist (Berl)*,53(11),1364-70, 1373-5.