Original Article

Study on Role Of Total Leukocytes Counts and Procalcitonin Levels in Patients with Sepsis

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ABSTRACT

Introduction: A dysregulated host response to infection results in sepsis, a potentially fatal organ failure. It is the cause of extreme morbidity, mortality, and global health care costs. The signs of sepsis are nonspecific, and a clinical diagnosis is frequently challenging. A better clinical outcome is achieved when sepsis is identified early and treated promptly.Although blood culture is still the gold standard for diagnosing sepsis, delays in detection and contamination are significant barriers to timely diagnosis.

Objectives of the study:to determine the levels of procalcitonin and total leukocyte counts in patients with sepsis and to correlate PCT levels with TLC in Sepsis patients.

Methodology: Procalcitonin was measured using chemiluminescence immunoassay, PCT value of >0.5 was considered significant as per manufacturer's instructions. TLC was measured by automated haematology analyser. Blood cultures were done by the automated BacTec BD system with strict aseptic precautions. Data were analysed by using descriptive and inferential statistics such as mean, percentage, standard deviation, range, correlation, Z test and Chi-square test. P value <0.05 was considered statistically significant.

Results: In the present study, 46 (51.11%) patients had positive culture and 44 (48.88%) had sterile culture with p < 0.05. Of the 74 culture-positive samples58.42% were Escherichia coli, 20% were Klebsiellapneumoniae and 7.24% Pseudomonas aeruginosa.Gram-negative organisms in our study had higher PCT levels (15.64±28.54) than Gram-positive organisms (12.32±26.23), although the difference is not statistically significant. There were no appreciable differences in the TLC level or mean CRP between the organisms.

Conclusion: Procalcitonin is a better diagnostic marker for the prediction of sepsis, due to lack of an ideal isolated marker it is better to combine with other markers like CRP for the prediction of sepsis.

Key-words: sepsis, procalcitonin, total leukocyte counts, bacterial and viral infections.

INTRODUCTION

A dysregulated host response to infection results in sepsis, a potentially fatal organ failure[1]. It is the cause of extreme morbidity, mortality, and global health care costs. The signs of sepsis are nonspecific, and a clinical diagnosis is frequently challenging. A better clinical outcome is achieved when sepsis is identified early and treated promptly[2,3]. Although blood culture is still the gold standard for diagnosing sepsis, delays in detection and contamination are significant barriers to timely diagnosis [4,5].

Precursor of calcitonin, PCT is utilized as a biomarker to guide antibiotic therapy to diagnose and prognosticate moderate-to-severe bacterial infections. PCT has a half-life of roughly 24 hours, peaks at 6 to 12 hours, and is detectable 3 to 4 hours after an infection[5,8]. Its favourable kinetic profile, along with its sensitivity and specificity for bacterial infection, make it appropriate for monitoring the diagnosis and advancement of the disease. PCT is regarded as a biomarker because of its ability to distinguish between inflammation caused by bacteria and that caused by non-bacteria[10,9].

CRP and total leucocyte count (TLC) are also employed as biomarkers for inflammation, but neither test has a 100% sensitivity rate. During bacterial infection, CRP increases slowly, leading to false-negative readings in early stages of the disease. CRP levels are also elevated in viral infections limiting its ability to distinguish between bacterial and viral infections.

Ourstudy was designed with the objective to determinePCT levels in patients with suspected sepsis and tocorrelate PCT levels with total leucocytecount (TLC).

MATERIALS AND METHODS

Study design: Hospital based retrospective study.

Duration: 6 months

Inclusion criteria: We included a total of 90 patients aged more than 18 years of both genders who were admitted in the emergency department fulfilling the criteria of diagnosis of sepsis as per ACCP [American College of Chest Physicians]. Presence of 2 or more of thefollowing features along with suspected or proven source of infection. Temp >38∘C (100.4∘F) or <36∘C (96.8∘F), Heart rate >90, Respiratory Rate >20or PaCO2< 32mmHg, WBC >12,000/mm3, <4000/mm3 OR >10% bands.

Exclusion Criteria: Patients with cardiogenic shock,recent major surgery, severe trauma, severe burns,small cell lung carcinoma, medullary carcinoma of thyroid, were excluded from the study, as PCT is non-specificallyelevated in these conditions.

Methodology: Procalcitonin was measured using chemiluminescence immunoassay, PCTvalue of >0.5 was consideredsignificant as per manufacturer's instructions.TLC was measured by automatedhaematology analyser. Blood cultures were done bythe automated BacTec BD system with strict asepticprecautions. Data were analysed by using descriptive and inferential statistics such as mean, percentage, standarddeviation, range, correlation, Z test and Chi-square test. P value <0.05 was considered statisticallysignificant.

RESULTS:

In the present study a total of 90 patients were included as per inclusion and exclusion criteria. Table 1: Shows distribution of patients and mean values of PCT based on different cut-off values of PCT.

Table 1: Shows the distribution of Procalcitonin levels in Sepsis patients				
PCT	<0.5	0.5-2	2-10	>10
No of sample	27	21	20	32
Mean±SD	0.22± 0.14	1.22± 0.42	5.1± 1.86	42.21±28.67
PCT <0.5: local bacterial infection, PCT 0.5-2: Systemic infection cannot be excluded PCT 2-10: Sepsis, PCT>10: Severe bacterial sepsis or septic shock				

Table 2: Shows the distribution of TLC levels based on PCT levels in Sepsis patients				
PCT	<0.5	0.5-2	2-10	>10
No of sample	27	21	20	32
Mean±SD	10328.6±3986.2	13422.8±7654.3	15632.2±5988.4	12432.3±8543.2
	r -0.0078	r-0.1098	r+0.1624	r-0.1652

DISCUSSION

Procalcitonin is a prognostic marker that shows the severity of bacterial sepsis and is utilized as a diagnostic marker for a number of clinical diseases. PCT clearance has been used as a gauge to evaluate a patient's sepsis recovery[13]. The study population's mean age was 53.45 years. Of the patients, 22.63% had PCT in the range of 0.5 to 1.9 ng/ml, 22.63% had 2–10 ng/ml, and 25.78% had >10 ng/ml. Several international investigations that were conducted found a similar distribution. Patients older than 57 years old had a higher risk of sepsis, according to a US study [14, 15]. In an epidemiological study of severe sepsis conducted in India, the mean age was 58.17 years[16].

In the present study, 46 (51.11%) patients had positive culture and 44 (48.88%) had sterile culture with $p < 0.05$. Of the 74 culture-positive samples58.42% were Escherichia coli, 20% were Klebsiella pneumoniae and 7.24% Pseudomonas aeruginosa.

Gram-negative organisms in our study had higher PCT levels (15.64±28.54) than Gram-positive organisms (12.32±26.23), although the difference is not statistically significant. There were no appreciable differences in the TLC level or mean CRP between the organisms. Similar to this study, Tanrıverdi et al. found that in individuals experiencing an acute exacerbation of chronic obstructive pulmonary disease, PCT was a more accurate predictor of bacterial infections than CRP[17].Titova et al. reported, in contrast to our findings, that in patients hospitalized with acute exacerbations of chronic obstructive pulmonary disease, the PCT had approximately the same accuracy as CRP and WBC in predicting pneumonia[18]. A correlation analysis between PCT values and TLC was conducted to predict the likelihood of sepsis. In patients with sepsis and septic shock, TLC displayed a statistically insignificant, mild negative connection with PCT. According to our findings, sepsis and septic shock are better predicted by PCT[22]. Menka et al. reached a similar conclusion to ours, stating that PCT and CRP are only indicators of sepsis and have no relationship to WBC levels. [23]

The current study was limited by its retrospective analysis and smaller sample size. Another significant drawback was the absence of biomarkers such as lactate level and persepsin were not done in this study.

CONCLUSION:

Procalcitonin is a better diagnostic marker for the prediction of sepsis, due to lack of an ideal isolated marker it is better to combine with other markers like CRP for the prediction of sepsis.

Conflicts of interest

There are no conflicts of interest

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