ORIGINAL RESEARCH PAPER

General Medicine

PROCALCITONIN VS C-REACTIVE PROTEIN: COMPARISON AS MARKERS OF SEVERITY IN SEPSIS- A HOSPITAL BASED OBSERVATIONAL STUDY FROM NORTH EAST INDIA.

KEY WORDS:
Sepsis,Procalcitonin,CRP

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ABSTRACT

BACKGROUND: Sepsis is a life-threatening organ dysfunction caused by the dysregulation of a host's response to infections (1) which is further complicated by an altered metabolic state. Both CRP and Procalcitonin are accepted sepsis markers. But there is still some debate regarding the correlation between their serum concentrations and sepsis severity. **MATERIALS AND METHODS** A prospective observational study was carried out in patients >18 years with sepsis and meeting the inclusion and exclusion criteria for a period of 6 months from 1st September 2021 to 28th February, 2022.The severity of sepsis related organ dysfunction was assessed by the SOFA score on day 1. Patients were categorized into 4 groups according to SOFA score as group 1 (0-6), group 2 (7-12), group 3 (13-18) and group 4(19-24). Serum PCT and CRP concentrations were measured on day 1 **RESULTS** A total of 50 patients presenting with sepsis were studied. The mean serum PCT concentration(ng/ml) in 4 SOFA groups was 7.61,28.47,40.16,85.09(p value<0.001) respectively. The mean CRP concentration (mg/ml) in 4 SOFA groups was 157.63,152.85,144.24,64.66 respectively (p value 0.13). Mean SOFA score was higher among patients who died (11.33±5.66) than those who survived (6.71±3.57) and the difference is statistically significant(p<0.001). The mean PCT (ng/ml) and CRP (mg/l) concentration in those who survived were 17.88 and 149.30 respectively and in those who died were 35.28(p value<0.001) and 160.46 (p value 0.167) respectively. The linear correlation between PCT plasma concentrations and the four categories was much stronger than in the case of CRP (Spearman's Rho, 0.483 vs -0.197; p<0.001) **CONCLUSION** SOFA score and serum PCT concentration show significant correlation with respect to severity of organ dysfunction and outcome in sepsis patients compared to serum CRP concentration

INTRODUCTION

Sepsis is a life-threatening organ dysfunction caused by the dysregulation of a host's response to infections (1) which is further complicated by an altered metabolic state.CRP is an acute phase protein produced by the liver in response to infection and/or inflammation. However, its low specificity for bacterial infections has become a major drawback for its use as a biomarker for adults in sepsis. Procalcitonin, is a prohormone of calcitonin, secreted by various organs in response to inflammation, especially bacterial stimulation. It has recently been proposed as a potential biomarker that aids in directing therapeutic decision making in sepsis management. Both CRP and Procalcitonin are accepted sepsis markers. But there is still some debate regarding the correlation between their serum concentrations and sepsis severity. Given the association between their serum concentrations and adverse outcomes in patients with sepsis, a humble attempt has been made through this study to compare the level of serum PCT and CRP at varied severity of organ dysfunction in sepsis in this part of north-east India.

MATERIALS AND METHODS

This study was conducted among 50 patients with sepsis in the Department of General Medicine, Silchar Medical College and Hospital. It was a hospital based prospective observational study done from September 2021 to February 2022 for a period of six months. The Institutional Ethics Committee approved the study and written consent was obtained from all the patients or their attendants. All the patients with clinical features suggestive of sepsis, such as tachypnoea, tachycardia, hypotension, altered mentation in presence of an infective focus were screened for eligibility criteria and assessed. These patients were immediately treated and stabilized. Informed and written consent was obtained from the patients or their attendant. Initial resuscitation, detailed clinical history and complete physical examination was done in all cases.

Patients at risk for sepsis were triaged using qSOFA. Any patient with qSOFA ≥2 was promptly identified to be at risk for sepsis. Routine investigations (which included complete blood count, random blood sugar, serum creatinine, total bilirubin, urine routine examination), arterial blood gas analysis, blood culture was done in all cases.

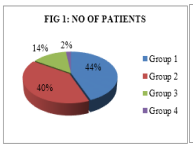
The severity of sepsis-related organ dysfunction was assessed by the Sequential Organ Failure Assessment (SOFA) score on day 1. Patients were categorized into 4 groups with different severity of organ dysfunction in sepsis according to SOFA score as group 1(0- 6), group 2(7-12), group 3(13-18) and group 4(19-24). Serum PCT and CRP concentrations were measured on day 1. The patients were then monitored until their discharge or demise. In four groups with increasing SOFA scores, we compared the values of PCT and CRP to determine the severity of organ dysfunction

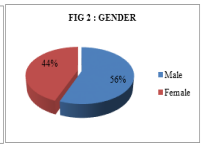
INCLUSION AND EXCLUSION CRITERIA:

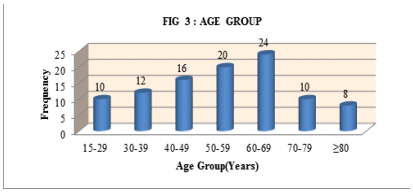
All patients of age ≥18 years with sepsis were included in the study. However, patients of age ≤ 18 years, patients with post-operative and post-traumatic sepsis, those with pre-existing thyroid disease that may affect the PCT values, diagnosed cases of auto immune disorder like rheumatoid arthritis, SLE etc were excluded from the study.

RESULTS

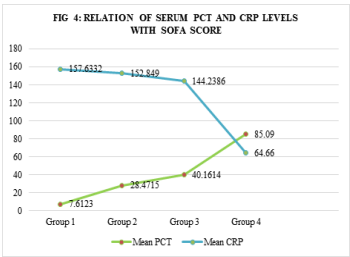
Out of 50 patients selected for the study, 28 were male and 22 were female. Most patients belonged to SOFA group 1 (44%), followed by group 2 and 3(40%,14% respectively) while least patients were in SOFA group 4(2%). Majority of the patients were in the age groups of 60-69 years (24%) with mean ± 1SD age of patients in the study being 54.20±16.29 years.







Mean PCT levels increased with the severity of organ dysfunction (highest in Group 4 and lowest in Group 1; p<0.001 respectively). No such trend was seen with CRP levels (p 0.13)



Out of 50 patients in our study,38(76%) survived while 12(24%) died. Mean PCT level in persons who survived was 17.88±11.87 ng/ml, whereas it was higher (35.28±21.49 ng/ml) in persons who died. No such relation was observed with respect to the mean CRP levels (149.30±16.98 mg/L in those who survived and 160.46±31.23 in those who died respectively).

Table 1 Outcome vs Mean Serum PCT and CRP concentration

VARIABLES	Survival	Death	Total	p value
S.PCT (ng/ml)	17.88±11.87	35.28±21.49	22.06±16.32	<0.001
S.CRP (mg/L)	149.30±16.98	160.46±31.23	151.98±21.44	0.167

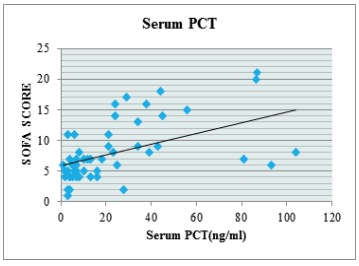


FIG 5: Positive correlation between SOFA Score and Serum PCT

DISCUSSION

The present study showed a male preponderance with 56% being males and 44% being females, the male: female ratio being 1.2:1, which was similar to the study observed by ***Patil HV et al*** [2] in which majority of the patients were males (67.19%).

Majority of the patients were in the age groups of 60-69 years (24%) with mean ± 1SD age of patients in the study was 54.20±16.29 years, which was comparable to the study by *Jain S et al*[3], in which the mean age of the patients was 50.7 ± 18.7 years.

In our study, mean serum PCT concentration were higher among patients with severe organ dysfunction (SOFA groups 3 and 4) than those with mild organ dysfunction (SOFA groups 1 and 2). The results were significant with a p-value <0. 001.Mean serum CRP concentration did not show any statistically significant difference with SOFA groups with a p-value of 0.13, similar to a study by Wang S et al [4] in which greater SOFA scores led to significantly higher PCT values, but not significantly higher CRP values. Mean serum PCT concentration(ng/ml) was higher among patients who died than those who survived and the difference is statistically significant (p <0.001). Mean serum CRP concentration(mg/L) did not differ much among survivors and non-survivors with the results being non-significant with a p-value of 0.167. Similar results were obtained in a study by *Hillas G et al* [5] in which no difference was found in CRP levels between survivors and non-survivors (p-value 0.456). Non-survivors had significantly higher PCT levels on day 1 and day 7(significant p-value<0.001).

There was a statistically significant positive correlation between SOFA score and mean serum PCT concentration (r value 0.483 & p-value <0.001) in our study. There was negligible correlation between SOFA score & mean CRP concentration in our study (r value -0.197, p-value 0.17). Similar results were obtained in a study by Wang S et al [4] in which the levels of CRP were not substantially correlated with SOFA score (r = -0.106, P = 0.282) while the values of PCT were significantly correlated with SOFA score (r =0.392, P <0.001). Higher SOFA scores resulted in considerably higher PCT readings, but not significantly higher CRP values.

LIMITATIONS

This was a single-centred hospital based observational study with a relatively small sample size of 50 patients conducted over a limited period of 6 months. The main drawback of our study is the small sample size in patient groups with severe organ dysfunction (SOFA groups 3 and 4), which reduces the strength of the conclusion and necessitates further validation of the findings through larger-scale studies. The results of this study tally with most of the studies conducted in India and abroad.

CONCLUSIONS

In contrast to CRP, which is frequently in the upper concentration range with low SOFA scores, PCT can be induced to reach very high serum concentrations during advanced stages of MODS. The severity of the infection more closely correlates with PCT and SOFA. To estimate the severity and prognosis of sepsis, PCT is a better parameter than CRP. The findings of this study are consistent with numerous national and international studies that have concluded that PCT has a better diagnostic capacity than CRP because of its close relationship to sepsis severity and outcome

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICTS OF INTEREST

There are no conflicts of interest.

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