Potential use of cytokine panel in management of severe COVID-19

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Introduction

- Severe SARS-CoV-2 infection (COVID-19) can lead to cytokine storm (CS) due to virally driven hyper-inflammation in some patients. However, increased pro-inflammatory cytokines are also seen in bacterial sepsis

- Procalcitonin (PCT) is an acute-phase reactant with concentrations ≥0.5 ng/mL indicative of possible bacterial infection. Therefore, it may help in identifying concurrent bacterial infection in patients with COVID-19 infection.

- The aim of this study was to compare cytokine panel with PCT and CRP in patients admitted to a London teaching hospital during the peak of the COVID-19 pandemic and assess its clinical utility in differentiating CS from concurrent bacterial infection.

Methods

- The retrospective analysis included, serum Interleukins; IL-1β, IL-6, IL-8 and Tumour Necrosis Factor alpha (TNFα) measured using Ella (automated ELISA) and PCT analysed by Roche Cobas in patients admitted between March and May 2020.

- Patients enrolled into COVID-19 clinical trials were excluded.

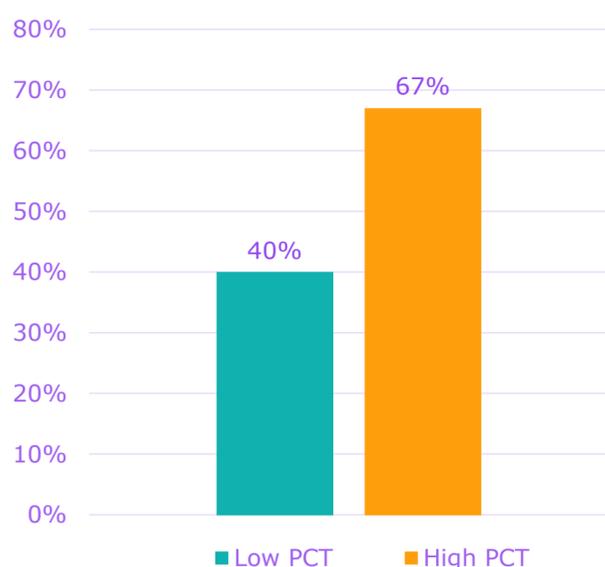- The cytokine data was compared between two groups; high PCT ≥ 0.5 vs. low PCT < 0.5 ng/ml.

Figure 1. Confirmed concurrent bacterial infection in low PCT vs high PCT group

Results

- Among 28 patients (68% M), aged 56(9) [mean (SD)] years, 24 had confirmed COVID-19 serology, two radiological evidence of COVID-19 and two other conditions. 25 were admitted to intensive care.

- Cytokine panel and CRP in patients with high PCT and low PCT are shown in **Table 1**.

- High PCT group (n=18) had higher TNFα (p<0.01) and relatively higher IL-1β, IL-6 and IL-8.

- High PCT group had longer ITU stay (mean 50 vs. 31 days) and higher rate of concurrent bacterial infections (67% vs. 40%) compared to patients with low PCT. (**Figure 1**)

- Overall, PCT correlated with TNFα (r=0.79, p<0.0001) and IL-8 (r=0.43, p=0.02).

- CRP correlated with IL-6 (r=0.66, p<0.001) and IL-1β (r=0.42, p=0.02).

Table 1:Cytokine panel and CRP in high vs. low PCT group)

Analyte	PCT >= 0.5 µg/L (n=18)	PCT < 0.5 µg/L (n=10)	P value
IL-1β	0.596 (0.327-1.095)	0.329 (0.294-0.922)	1.00
IL-6	36.5 (20.8-62.85)	22.35 (14.52-42.97)	0.37
IL-8	72.2 (54.85-96.4)	58.35 (39.47-60.87)	0.49
TNFα	35.4 (27.17 – 42.52)	19.55 (14.07-25.07)	<0.01
CRP	82.45 (50.2 – 120.1)	79.6 (59.3-90.1)	0.92

Data is presented as median (IQR)

Conclusion

- In our COVID-19 cohort, the cytokine panel in combination with PCT, helped in identifying cytokine storm (elevated IL-6) and concurrent bacterial infection (elevated TNFα).

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